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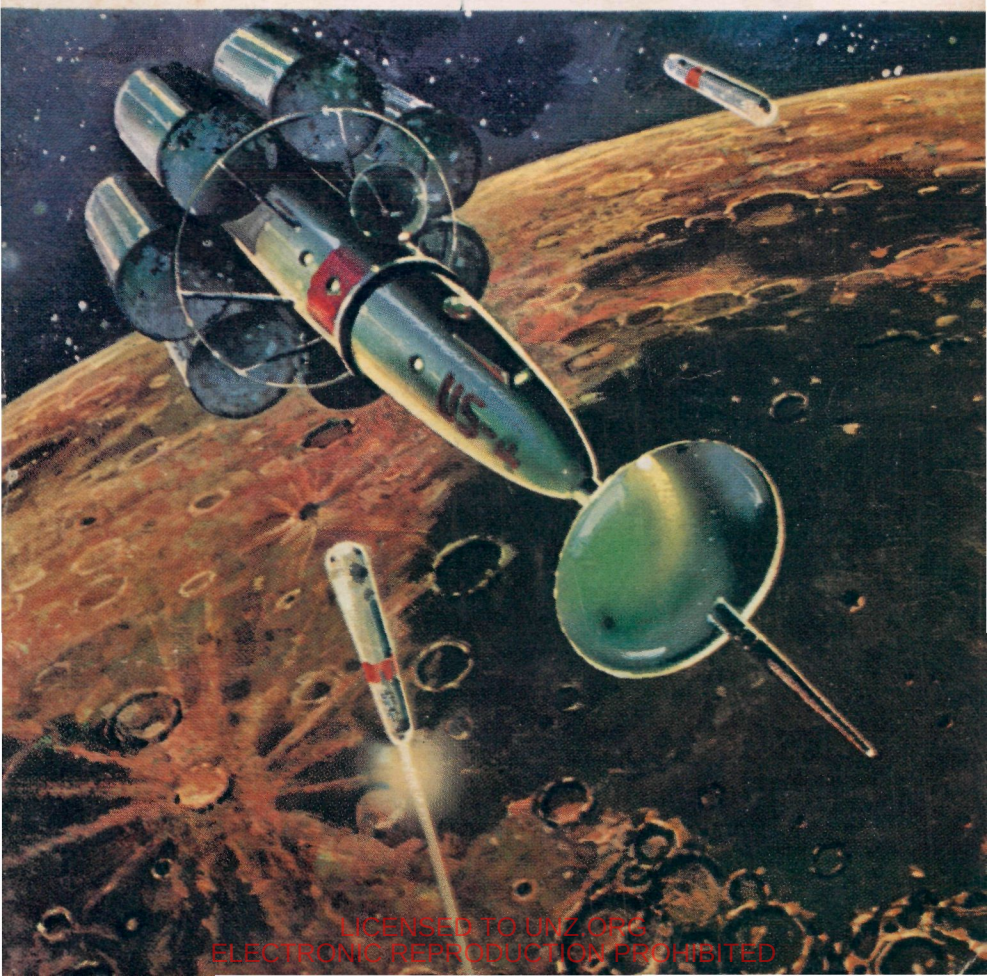

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WORLDS OF TOMORROW®

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ALL NEW STORIES

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OUT THERE

By now we've all got the figures down pat: There are (more or less) a hundred billion stars in our galaxy, and (more or less) a billion other known or predicted galaxies; and no matter how you stack the percentages against any particular star in any particular galaxy having planets bearing intelligent life, you still wind up with a lot of life-bearing planets.

The conclusion we can draw from that is that a lot of science-fiction stories might not always stay fiction. Possibly something very like the events they describe might some day happen.

A clutch of recent books (none of them by science-fiction writers) explores this and related questions to a fare-you-well. V. A. Firsoff, in *Life Beyond the Earth* (Basic Books) examines the question of what sort of planets might be inhabitable; Stephen H. Dole's *Habitable Planets for Man* (Blaisdell) restricts its field of view to those which are possible homes for creatures like human beings; in *We Are Not Alone* (McGraw-Hill), Walter Sullivan covers those questions early and goes on to the problem of what do we do about it—i. e., how to contact other races and what will happen if they call on us.

These are fascinating books. Dole's, which began as an Air Force project carried out by the RAND Corporation, is rather more than a job of reportage. In it the author attempts to convert the gambler's "probably" as an assessment of the prospects of finding intelligent life outside the Earth into a numerical statement of the odds. What, asks Dole, are the conditions that a planet must have to support human life? (Not necessarily to *evolve* human life. Dole it looking for planets that man might colonize, as well as those which may have bred their own populations.) For one thing, its parent sun must be not too unlike Sol in mass—from 0.35 to 1.43 solar masses, say. For a second, this suitable sun must have planets. For a third, the inclination of the planet's equator and its orbital distance must be within given parameters. The planet's mass must be no less than 0.4 and no more than 2.35 Earth's. The planet's orbit must not be unduly eccentric, nor may it be perturbed by the presence of a binary companion to its sun (some binaries may be suitable; it is a matter of where the binary is located in relation to the primary and the planet). Age and rate of rotation are to be considered; as is,

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finally, the probability that life has developed on this planet.

The answer? Well, there are some pretty large assumptions in nearly all of the individual factors; but hopefully they will more or less cancel each other out.

But, bearing in mind that it can be only an approximation, Dole does indeed come up with a figure. In our own galaxy alone, he says, there seem to be some 600,000,000 planets that Man can live on.

So much for warm-blooded, one G, 20% - oxygen mammals. What about chlorine-breathers, silicon-celled cryoforms, or whatever? What in short about the possibilities of life on planets where Man could never survive?

It is to this question primarily that V. A. Firsoff devotes his book. Firsoff has always been one of the most lively and entertaining of astronomers—witness *Strange World of the Moon* and *Our Neighbor Worlds*—and here is a subject on which he can really spread himself. Firsoff sees very few corners in the universe where life really cannot be expected to be found. Temperature is not an insuperable problem, for Firsoff has examined possible chemical bases for life which cover "as wide a range of temperatures and conditions as one could hope for from a few degrees above the Absolute Zero to the boiling point of lead, and perhaps beyond." Pressure is no more an obstacle than temperature. Neither is total darkness, nor does a planet even need a solid surface—as we see from our own marine organisms which do splendidly without ever touching ground.

Quirky, informed and articulate, Firsoff is fascinating reading. He is willing to take time out to examine the claims of parapsychology and to disagree with the interpretation of Mariner II's instrument readings on Venus; he solves vexed and irrelevant questions in his stride—for example, writing in England, largely for an American audience, he resolves the difficulty of the English and the American "billion" by inventing a new word for the quantity 1,000,000,000. He calls it a "gillion."

There are two ways of advancing scientific knowledge. One is to successively eliminate possibilities until what you are left with is a fact. The other is to build up a pyramid of facts that will suggest new possibilities. Firsoff is a pyramid builder—and a fine one!

Walter Sullivan is not a scientist but a journalist, science editor for the New York *Times* and a reliable reporter. He is less interested in the theoretical probabilities of life than in what people are doing about it all, right now.

It turns out people are doing quite a lot. All over the world, in fact, many thousands of scientists are busied in scores or hundreds of projects which have to do with the attempt to get Out There—if not in the flesh, then at least by means of rocket probes, radio messages, laser beams or whatever.

Perhaps the most interesting of

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these projects are those which revolve around the problem of figuring out how to listen in on the messages that presumably are flashing around the galaxy even now. This is a majestic game, and it was played with particular skill and devotion at the conference in Green Bank, West Virginia, in November, 1961. After Giuseppe Cocconi's conjecture, in 1959, that the 21 centimeter emission band of neutral hydrogen represented a frequency that nearly all intelligent cultures would at least from time to time be listening in on, the next problem is, "What should an interstellar message be like?" In other words, what language can be used to communicate between stars, assuming that no other contact is possible and that the language must not only convey information, but at the same time contain its own instructions for decoding?

One of the most interesting suggestions along these lines was advanced by Frank Drake, who proposed sending a binary number of 1,721 digits.

That was all there was to it: merely a string of O's and 1's, nothing else. Could it be decoded?

To test it out, Drake sent his message to a list of the others who had been involved in the Green Bank conference. One of them did in fact decode the message. The number 1,271, he reasoned was the sum of two primes, 31 and 41. This suggested making a grid, 31x41 in dimensions. If this were done with squares, as in graph paper, and the squares represented as "1" blacked in and the squares represented as "0" left white, why, the result would form a sort of mosaic picture.

And, in fact, it did: Drake had made a sort of schematic drawing of man, woman, child, a sun, and a number of physical constants represented by numbers of dots.

Of course, the fact that a human being—moreover, one who knew the sender and the way his mind worked—was able to deciper a message does not necessarily mean that a three-headed inhabitant of a planet of Epsilon Eridani might do the same. In fact, some linguists argue that communication is impossible on these terms, because language cannot be communicated unless in the first instance information is received simultaneously on two channels. We took part in such a discussion not long ago, with some philologists on the faculty of a large university; their position was that language is taught by pointing to a cup and saying "cup", and without the two access channels for comparison and checking it can never be taught at all. (The argument did not convince us. We can think of at least one rational, isolated entity which has been taught language through a single channel: her name was Helen Keller.)

Philip Morrison ponts out that what is needed for these projects is a new science which he calls "anti-cryptography", i.e., the designing of codes as easy as possible to decipher. Drake's binary graph is surely at least one step on the way. For other steps, see *We Are Not Alone!*

—FREDERIK POHL

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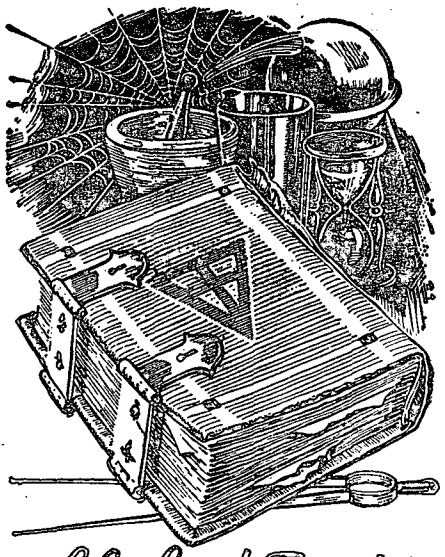
Secrets entrusted to a few



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WHAT SIZE ARE GIANTS?

by ALEXEI PANSHIN

Illustrated by NODEL

Even the spacemen brawled like wild beasts—down on the worlds of men!

I

The road was the only sign of man in the narrow green valley on Morrow. It walked on cat feet beside a wild stream that cut a course down the valley's length, finding an uneasy foothold between the water and the rising wall. Even to call it a road was to exaggerate both what it was and man's importance in this place. It was a path, the common path of everything that traveled in the valley, and man's contribution was the faint double impress of wagon marks, and that was all.

Judith Adello was out of place here, sitting calmly reading miles from any settlement. She sat against a large rock in the sunlight by the edge of the white water, the light breeze ruffling her hair. There was a brown canvas knapsack at her feet.

She wasn't expecting to see anyone here where travel was rare, so when the white-topped wagon hove into sight under the slim-trunked umbrella trees, she was surprised.

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Since it headed in the right direction she decided to try to catch a ride with it. She closed her book, shoved it away in her pack, pulling the flap closed, and then stood waiting, a hand shading her eyes. She was tall, all of six feet, a big, strongly built, attractive girl wearing a rough shirt and pants. Absently with her shading hand she pushed a wind-blown lock of brown shoulder-length hair back from her face, and looked down the road.

She became less sure of herself as the vehicle approached. It wasn't a proper wagon at all, but a large two-wheeled van of a sort she had never seen before. Again, it would have been one thing if it were proceeding in a normally sedate manner, pulled by a gallant, gentile horse, but this van was lurching full tilt along the trace as though devils were nipping at its heels. It was barely managing to thread its way between the rocky wall and the equally rocky water, barely holding its uneasy balance, and under the reins was no horse but a great lumbering titanoth. A titanoth in captivity, let alone in harness, was another thing Judith had never seen before. Titanoths were notoriously uncertain beasts that ranged the country in thumping herds, at times going berserk without warning and stamping everything flat that was unfortunate enough to fall into their blind path.

Judith wasn't at all certain she wanted to ride with that and she made no signal to halt the van. However, the driver saw her at a good distance and began to ease the pace of his animal, and finally brought the van to a stop beside her. It looked odd with only two wheels, as though it were only half there, as unbalanced as a chicken without its tail feathers. The titanoth in its fancy padded harness labored for breath, honking slightly. It was a giant graviportal mammal with heavy feet like wastebaskets, and on its broad twitching nose were positioned bulging twin battering rams. Its hairless skin was a basic brown and as it wheezed and sucked for air, Judith saw that its eyes were an innocent and astonishing blue.

The driver was a very large young man with black hair, a hooked nose and almost an Aztec look. He motioned at the seat beside him and said, "Get aboard."

Judith said, "But I don't know you."

"My name is Michael ap-Davis," the young man said. "There's a herd of charging titanoths just behind me. If you listen, you can hear them. If you want to be alive five minutes from now, you're going to have to climb, swim, or get aboard."

He said this unhurriedly, but he lifted the reins and the titanoth pricked up its round little ears. In that short moment before she made up her mind, Judith heard nothing, but listening she felt the ground whispering to her and that made her decision. A clutch of birds suddenly fled screaming across the sky overhead. Michael ap-Davis brought the reins down and the covered van began to move. Judith threw her

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knapsack behind the seat, reached up and swung herself aboard.

Hoarsely, the young man screamed, "Ey-yah!" in a call that ended like a whip crack.

The van lurched as the titanoth heaved into full gear, its great round feet stomping in regular order like pistons, and Judith sprawled off-balance across the seat. She said nothing to the driver, but simply held on as best she could, figuring he needed all his concentration to keep them upright.

The van may have had springs, but if it did they had too big a job to accomplish. There were rocks in the trace, an uneven grade, and roots from the umbrella trees that spread like tents above. The stream made sudden turns and the trace turned with it; all combined to make the road rough and uncertain.

They careened along, Judith jouncing and barely keeping her seat. The van was spurred by the now-audible and unsettling sound of mumbling thunder. Though his hands were occupied, Michael ap-Davis kept his own seat partly by braced legs, partly by what must have been will power.

A realist in a romantic world is a sour figure who causes trouble only to himself, but a romantic in a real world blithely causes trouble he never recks. Judith was a romantic. She had romantic notions. The book in her pack was a romantic novel written on Old Earth long before the Population Wars made the planet an uninhabited wasteland. Her reasons for being out here so far from any place were romantic ones. Judith was a romantic mainly because she was young and lucky enough — in this time and place — to have the sort of father who didn't kill the intelligence, the independent mind, the life and the romance within her, knowing the rare sort of person she would be when the dreams were outgrown.

But that was later—now she was a romantic.

As they heeled and reached along, her mind speculated about Michael ap-Davis. He and his van, his titanoth, and more besides that she didn't even know of, all smacked of different people and far places.

George, the titanoth pulling the wagon, was at a disadvantage in this race. He had a good weight to pull and a less compelling reason to run than the herd behind them. It was clear after a time that he couldn't keep the pace up, not for any great length of time, and already they were being gained upon. The thunder was no longer mumbling and a look behind them showed roiling dust.

The day and the valley were used to quiet, silent life and silent death, and these sudden heavy noises were an alien note in the sunshine and bright calm. More birds hurled themselves up to cry and serve as wheeling witnesses of the uncertain race beneath them. Judith saw them overhead, and then, surprisingly, saw one bird detach itself and start to glide down heading toward them.

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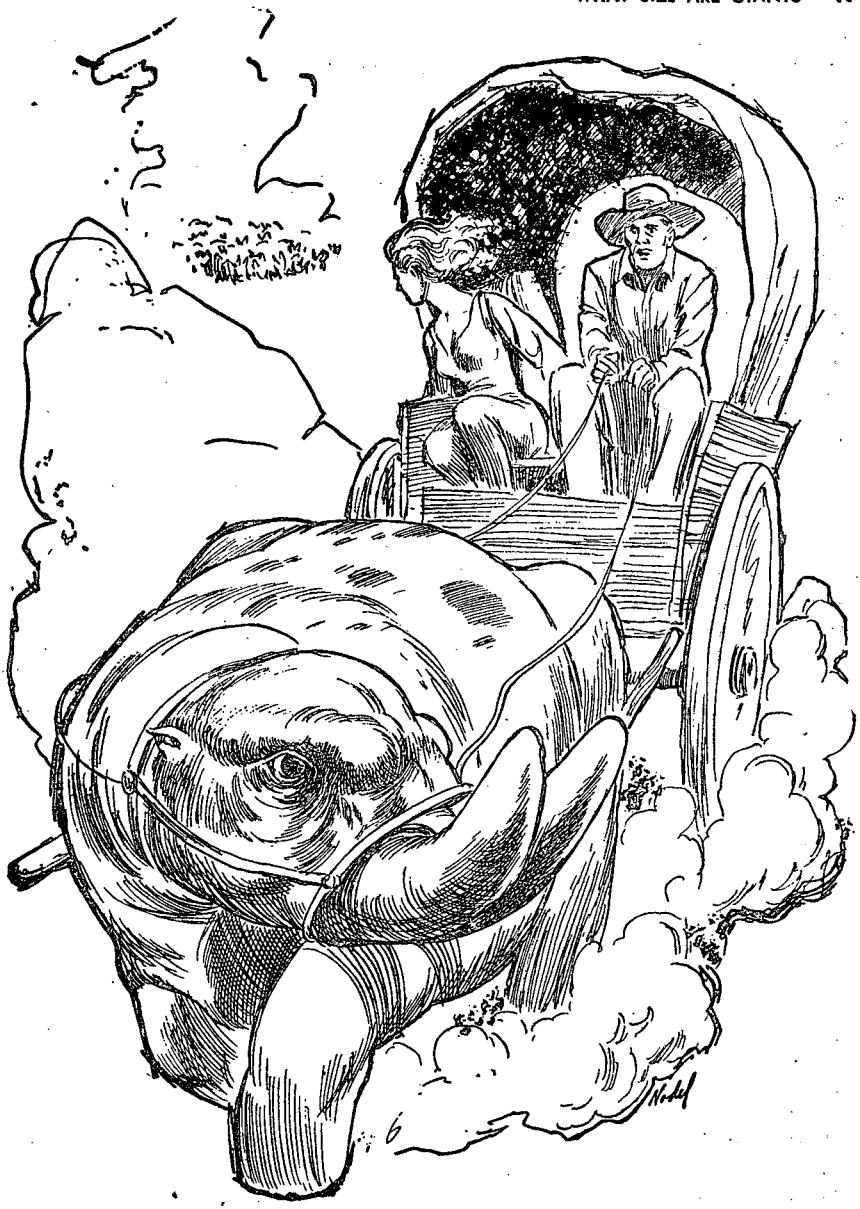

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It was a moderately large, black bird with white wings and a white ring around the neck. There was a pole set into the wagon frame just beside and behind Michael's seat, and there were several pegs set into the pole at different angles and various heights. The bird lit on one just above Michael's head and sat there teetering. It had fierce red eyes, but otherwise it looked harmless.

The young man said, "I certainly am glad to see you. What word do you have?"

In a hoarse, but perfectly intelligible voice, the bird said, "There's a small cut about a quarter of a mile ahead. I think you can squeeze into it. Who's the peasant?"

It didn't please Judith to be referred to that way, but Michael said, "She was sitting back in the valley and I didn't want to leave her there."

The bird grunted.

Michael said, "I don't know if George can make it. Talk to him, Rollo."

The bird flashed off its perch and onto the harness by the titanoth's ear. It muttered soft syllables and the faltering beast heaved its full weight into the traces. The van increased its speed slightly. In a moment they came round a little bend, and there was the defile ahead opening off to the left where a little stream plunged downhill to meet the river. They were there in a minute, but there wasn't room for the wagon between the rocks lying carelessly at the mouth of the cut.

Michael was down in a moment, pushing at the boulders, and Judith jumped down right behind him. The ground was shaking now, and above the heavy rumble they could hear the first honks of the plunging titanoths. They tossed aside the smaller boulders, and then together moved the last big monster out of the way. The cut was not clear, but as clear as they could make it.

Michael grabbed the titanoth by its head harness, Rollo fluttering up. Michael yanked and yelled and the exhausted beast pulled ahead. Judith pushed at the van from behind and it turned and moved to the edge of the narrow defile, stuck for a moment as its wheels came against rocks imbedded in the ground. Then being both pushed and pulled and screamed at by Rollo, they moved ahead again, teetering and nearly tipping and finally stopping ten feet off the trace and six feet uphill.

Judith braced her back against the tail of the van, not sure whether she was keeping it from rolling backwards or it was keeping her from falling flat on her face with fatigue. She had hardly fifteen seconds to stand there when the first of the titanoths reached them.

The noise was overwhelming, a pounding so loud it almost seemed to penetrate her head. The first titanoth was black, and she distinguished colors on the next few, but after that they were such a solid, plunging mass that she could see no one of them clearly. They smelled, a warm, musky odor, or

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at least she thought so, and above the pounding, almost as a counterpoint, she could hear them honking and crying. There was dust, too, a great heavy cloud, so thick that after only a moment or two she had to turn her back and move uphill.

She was glad to move, too, because even standing above them with no danger from the great herd, the churning profligate power was chilling. It seemed like a magnet, pulling, in the same way as the edge of a tall building, and if you weren't careful you felt you would fall in and be destroyed.

She edged along the side of the van, past George who was shaking his heavy head and honking uneasily. She knelt up there by the brook with her back turned and her ears covered against a noise she couldn't shut out.

The animals took a full five minutes to pass, and when they were gone Michael took Judith by the shoulder and shook her. Only then did she take her hands from her ears and stand. She had mud on her pants and on her hands that could only have come as they had fought the boulders free from the edge of the stream, but she hadn't even noticed until now. Absently she wiped her hands on her pants and knocked the mud off, then brushed at one ear that she had dirtied.

Then finally she slowly turned around and looked. The rumble of the animals lingered as a tight knot in her stomach and the dust of their passing hung in the air, only toyed with as yet by the light breeze. The path, which had been flattened grass and stones with only an occasional bare patch was now plain dirt, churned up and then stamped flat.

Michael said, "Look," and pointed.

Floating and turning, pushed by rushing white water, came the body of a drowned gray titanoth. It hung for a moment on a large rock in midstream, turned lazily end for end and came free, and then swept on again as though vainly trying to catch up with its recently passed comrades.

"All right," Michael said as it moved on out of sight, "let's see if we can get the wagon free."

It took them nearly an hour to get started again. More effort was needed to get the van free and on the trace again than to put it into the cut in the first place, and Michael and Judith were both tired enough that they worked slowly with frequent pauses for breath. Then, when the wagon was free and on the road, they sat down again and rested. Through it all, Rollo sat perched on George, who was catching his own wind, talked to him and groomed his hide of occasional pests.

His only public comment was, "There seem to be a lot more of these sweet white mites these past few days," as he picked off a morsel and ate it.

Judith wasn't sure whether her status was "honored comrade in arms" or "that peasant girl". She

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didn't ask and Michael didn't tell her. She simply pitched in with the thought that in the long run it was easier to ride than to walk, particularly now when she had a much higher opinion of George's relative trustworthiness.

As they worked, she did gesture at the path and say, "Do you have any idea what sets them off like that?"

Michael shoved at the wagon and said, "I'm not sure. I think part of it is that they have very sensitive skins. George is quite ticklish."

When the van was on the road, tongue down, and George with Rollo was up the hill cropping at the field grass, they sat down and rested.

Judith asked, "Won't the titanoth wander?"

Michael shook his head. "No, not with Rollo watching him. Rollo has a lot more control of him than I have. He grooms him and talks to him, and without that George wouldn't pull."

They fell silent again and then after a few more minutes Michael asked, as though it were something he had been mulling over, "How far are you going?"

"About forty miles up the trace," Judith said. "My . . . dad lives there. It's the first town."

He nodded.

"All right. If you want to ride along, you can. What's your name, by the way?"

"Judith Adello," she said.

"Michael ap-Davis," he said again, and they shook hands, one quick shake.

II

When they were on the road again, George simply ambled and Michael didn't ask for more of him. Rollo had flown out again to scout over the green and broken country, getting a perspective on what lay ahead and behind. Inflated a little by his success, and that it undeniably was—a rare and altogether fine success—he came buzzing in from time to time with what were patently trivia, no more than excuses which allowed him the chance to report to an audience. After the third time he came in to tell of a titanoth body in the path ahead, Michael was somewhat brisk with him which made Rollo flap off with an air that said he was entirely misunderstood and ill-used.

"Rollo is a good friend, but he has no understanding of human nature," Michael said. "Sometimes he reminds me of a little boy."

As they traveled, Michael asked, "What were you doing out here so far from any people? It's a dangerous country."

"Not really. There's only the titanoths and as you said, I could have climbed or swum."

"Can you swim?"

"Well enough," Judith said.

"And what were you doing out here?"

"You've heard of people running away from home? Well, I did that. Now I'm on my way home again. I didn't find things the way I thought they'd be."

"Well, why did you run away in the first place?"

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She looked over at Michael, a young man all of six feet five inches tall sitting next to her with the lines loosely held in his hand, and then she looked away. After a minute, she said, "I can't tell you that."

There weren't many people she could have told, and not Michael in particular. No one knew—well, her father knew, not because she had said anything before she left, but because she'd lived with him all her life and he was a perceptive man.

To cover the moment, she asked, "And where are you going."

"Nowhere in particular. Mostly we're just seeing where the roads go to."

Judith said, "You aren't from around here." That was clear enough; people around here didn't drive two-wheeled carts pulled by titanoths and travel with talking birds.

"No, we're not." Michael gestured at the white peaks that lay behind them, that could just be seen above the farther rim of the valley, contrasting sharply with the green of the thick line of umbrella trees, pertocket, and scrub that covered the rim. "We came from south of the mountains."

He said it in a straight forward manner, but he knew well enough what it meant to turn to watch Judith's reaction, which was all he could have asked for. She'd never known anyone who had crossed the mountains. She'd never even heard before of anyone who'd done it.

"Rollo found the way," Michael said. "It took us a week to do it, but we got through. I imagine if people started using the route we took regularly, it could be turned into a road and it wouldn't take more than a couple of days to get across."

"But why did you do it?" Judith asked.

Michael shrugged. "Just to do it. We've got some blankets and beads to trade and Rollo knows some funny stories. We'll get by."

It all sounded thoroughly romantic to Judith, and she was more intrigued than ever. The trouble is that while it wasn't an outright lie, there wasn't a great deal of truth in it, either, and the real situation was hardly romantic. It was true that they had come from south of the mountains, but that wasn't romantic. In fact, it had been a potful of hard work. And while it was true that they had come from south of the mountains, that wasn't the place from which Rollo and Michael had started.

And, finally, their reasons for coming were hardly just for the sake of doing it, or for the sake of trade. Michael was interested in eating, but beyond that there was nothing here he was particularly interested in trading for.

"Are there many birds like Rollo south of the mountains?" Judith asked.

"Many? No, I wouldn't say there were many."

George ambled on. At one point, Judith got off and walked, simply to have the chance to stretch her legs. She had no trouble keeping up,

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even with pauses to tie her shoe, to pick a flower some distance up the hill, and to try a half-dozen times to get a stone to skip three times on the water before falling dead. At another point, when Judith was riding again, they passed Rollo sitting perched high on a cliff above their heads. He studiously ignored them.

Judith said, "I'm surprised we haven't seen any of the tites. I wouldn't think they could run this far."

"I don't know. This was the first time I've seen them run, but I was told they sometimes run until they all fall down dead."

They talked on, and later. Michael asked, with seeming casualness, "What do you think of the Ships?"

She said, "I hate them. They just dumped us here, and then ran out. And did you ever see the people when they come down here? They strut around with their machines like the Lords of Creation, and never mind that by right we should have everything they do. I'd like to see the stars. God, how I hate them."

Michael nodded. He wasn't about to argue the point.

Judith's attitude was not totally unjustified. Michael had enough objectivity to see that, though he didn't like it and didn't agree with it.

Some people were perceptive enough to see the Population Wars were bound to come on Old Earth, and important enough to do something, a bare something, to lessen their impact, to save what little could be saved. Over a period of fifteen years, eight great starships were built, carrying away a million colonists at a time, founding in all 112 colonies on as many planets. The colonists were given simple shelters, simple tools, seeds, and horses. They were lied to, and they were abandoned because there was nothing else to do if anything at all were to be saved before the final, searing, destroying war came to burn Earth clean. It might not have been the fair, open way to do things, it might not have been right, but that was the way things did happen.

Later, when Earth was a cinder, the Ships were left as cruising afterthoughts. If the original plan had been followed, they would have been looted, stripped down for whatever they could lend to the colonies, but that never happened. Seven surviving Ships don't divide well among 112 colonies spread over all the twelve quadrants of space, but even if there had been a way to divide them, it would never have happened. The crews, nearly thirty thousand in each Ship, were technically and scientifically trained people for the most part, and they saw no reason why they should give up a life that suited them very well in exchange for a precarious existence on one or another of the colonies, and it might even be argued that if they had happened to pick a colony that didn't survive, a significant percentage of man's knowledge would have been lost. They got along very well as they were, and through the years they continued to. Again, it might not have been

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right, but that was the way things were.

This meant that there were two distinct classes amongst the heirs of man. In general, those aboard the ships looked down on the people of the colonies as their social and mental inferiors and made no bones about it, disregarding completely the historical reasons for the differences between them. For the most part they had as little to do with the colonists as possible. In general, the colonists looked at the stars and hated.

Michael ap-Davis came from the starship once called No. 6. He thought of it simply as "the Ship". His reason for being here on Morrow was that he was an anthropologist, no longer content to simply read books. His instructions were that he was only to observe and take notes, but that had proved to be not enough for him, either.

"You can't test theory by simply watching," he said. Rollo's answer was an earnest request that they drop all this foolishness and go home.

Rollo, the bird, was a mutation, one of a kind. He had been raised on the Ship to think of himself as People—as opposed to the non-people on the colonies. He was a firm and long-time friend of Michael, enough of a friend to accompany him here to this wild and God-forsaken place. But he didn't approve of what Michael was doing, and said so, strongly enough that relations between them were not completely happy.

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"You'll only get yourself in trouble," Rollo said. "Even if what you do helps these peasants, it won't make any difference at home. You're not supposed to meddle."

He was right, too. It was a firm rule admitting of no exceptions, but Michael went ahead anyway, not being about to be turned aside by anything quite that trivial.

Michael wasn't surprised by Judith's answer, and he didn't argue it. He simply mumbled something neutral sounding, and kept driving.

Then ahead of them on the road was the corpse of another titanoth. It might have stumbled and been trampled to death, or it might have had a heart attack. It was a small animal, probably immature, and its black-spots-on-white body lay in the middle of the trace with not quite enough room on either side of it for them to go around.

Michael called, "Whoa down," and stopped the canvas-topped van just short of the dead titanoth.

"Sit tight," he said to Judith, and hopped down to take a look.

It was indisputably dead and in the way. He walked around it, gauging it for size and placement, and then finally he put one hand under its chin and with the other gripped the knobs on its nose. He braced himself and then gave a great heave. With two heaves it was moved far enough and he let go, but then something caught his eye and he knelt by the body. For a minute or two he examined the hide of the dead beast, even running his fingers over it. Finally he shrugged and stood up.

When he came back to the van, Judith asked, "What was it you were looking at?"

Michael said, "Dead titanoth."

That was all he said. He climbed up to the box and clucked to George. As they drove past, Judith looked down at the body of the beast, but she saw nothing out of the ordinary.

Soon after that they came to the welcome end of the narrow valley. Once safely out of its confines, they were able to stop traveling, and were in fact most ready to. Soon after they stopped, Rollo flew in, said hello in a perfectly friendly way and set to taking dessert, if not dinner, off George's hide.

III

It was two days later and the height of the afternoon. The road—and it was a real, honest and true dirt road now—wound between occasional farms sitting flatly in the broad bottom. The charging stream the trace had followed had far back joined a wide and easy-flowing river in a gentle, verdant valley of its own. For two days they had been traveling up the valley. The valley was starting to narrow now.

Judith's town was called Homestead and she pointed out its location long before they came to it. The land was broken here into three distinct steps. Lowest was the valley. Then there was a sharp rise to a plateau of grass and a few hardy trees perhaps a thousand feet above. Finally there was another rise to

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lonesome, tumbled rocky country even higher.

"See that notch?" she asked. "That's the only easy way up to the plateau. The road goes up there onto the level, and then leads around the edge of the high country. The town sits at the bottom of the notch."

"The land up above isn't level," Rollo corrected from the top perch of his riding pole. "It slopes upward."

It took another hour to reach the town. Just before they got there, they stopped by the smooth running river to wash off some of their travel dirt. Rollo saw no reason to stay around, so he flew off to look the town over, saying he would meet Michael when he caught up. Michael knelt by the water and used some beard cream to get rid of his whiskers, then washed his face and hands.

Judith scrubbed up, too, since she wanted to look her best when she got home. Not that she would be any more or any less welcome—she simply didn't want to come home looking as though there wasn't another place in the world that would have her.

She paused in her scrubbing and simply felt the soap. "It's so smooth," she said delightedly. "I've never seen anything like it. Where did you get it?"

Michael finished wiping his face. He said, "They make it in the south. I've got more in my wagon."

There were a few more bends in the road and a final tree-lined rise, and then they were easing down the slope and into the town nestled into the foot of the notch. At the edge of town there were several pens with medium-sized animals with long straight yellow hair all over their bodies, long enough hair to lap at the ground. Like the much larger titanoths, they had twin lumps of bone on broad noses to use in self-protection. Judith had pointed them out on farms as they passed and called them "woolies". They milled in the pens, raising swirls of dust, hooting at the van as it passed.

The town was small, hardly more than a single street, hardly more than a settlement. The buildings were made of rude, unfinished boards or chinked logs, solid and permanent and drab, flowers or curtains lending the only color. Michael noted that all the buildings had glass windows. He had asked Judith who lived in the town and she had named the Brumagians who were glassworkers; the smith; the barber-doctor; Anders who kept the market, made and sold liquor; the cooper-carpenter; her father, who taught; and the families who herded their woolies upon the plateau, clipped the hair and made cloth. There were faces at the windows and turned heads as the strange van made its way into town.

"Which is your house?" Michael asked.

Judith pointed it out, a neat log house with a shed attached standing under the shelter of two well-made umbrella trees, and Michael drew up in front. Judith jumped

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down and took her pack as Michael handed it down to her.

"Thank you for the ride," she said. "I'll see you again, won't I?"

"Probably. I'll be in town for a few days, at least," he said. "Would you do me a favor and tell your father I'd like to talk with him when he has some time to spare?"

"All right," Judith said.

Michael drove on outside the town and pulled up on a level spot. There he unhitched George, tethered, watered and fed him. Rollo flew in then to perch and groom and talk to George.

In the meantime, some of the curious had gathered and were standing at a cautious distance, not sure what tack to take. They watched as Michael set up a little tent, ignoring them completely.

Finally, one of them stepped forward, a big balding man as rudely dressed as the rest, but somehow seeming more prosperous. "Care to explain yourself?" he said.

Rollo looked at him with a jaundiced eye from George's back. "At least one of them can speak up," he said.

The man looked at him, startled. Michael moved forward and stuck out a hand. "Don't mind Rollo. Would you be Mr. Anders by any chance?"

The man said, "Why, yes."

"I'm Michael ap-Davis. I've heard of you. If your liquor is what they say it is, bring some out tonight. We may be able to work up some sort of trade."

"You're a trader?"

"Partly. I hope I'm not presuming too much by setting up here, but I figured if someone had objections or there was a rent, I'd be told soon enough."

The big, bald man shook his head. "There're no objections. It's just we don't see many strangers around here, especially not ones as strange as you seem to be. We were just curious as to what you had in mind."

Rollo snapped up a morsel and then said to Anders. "Don't have anything to do with this fellow. He's a dangerous maniac. If you knew anything at all about him, you'd kick him out of town."

Anders looked at Michael. "Does it know what it's saying, or is it just repeating words?" he asked *sotto voce.*

"Oh, he knows what he's saying well enough," Michael said. "Rollo, if you want to settle this, talk to me later, but don't do this."

After a moment, Rollo said, "All right," and then turned his back.

Anders asked, "How do you keep control of that tite? We kill 'em for food, but I never heard of anybody driving one before. They're not trustworthy."

Michael waved at George, placidly pulling up grass. "George there hasn't given me any trouble. He doesn't look exactly dangerous, does he?"

Anders said, "All I know is that every eight or ten years they go wild, wilder than usual that is, and knock down everything they come across. That's the way they are right now."

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A man sitting on a horse among the onlookers said, "That's right, mister," and spat.

Michael looked at Rollo picking mites off George's back, said, "I don't think you have to worry. George hasn't run away with me yet, and if it'll make you more comfortable, I'll see he's hobbled." He raised his voice, speaking to the people as a whole. "All of you come out here tonight. Bring your families, and bring a couple of sticks of wood each, too. There'll be a fire and a show. And after that, there'll be some things to trade that I've brought over the mountains."

More people showed up than Michael would have imagined. They brought blankets and chairs to sit on, things to trade, and plenty of wood.

They walked out after the sun had set. The cool evening breeze was starting to carry off the heat of day and the first stars were starting to show in the deep velvet overhead.

The fire was built in front of the wagons, a large fire, and the left-over wood was piled nearby where it could be tossed on from time to time as it was needed.

They came, hungry for nothing but the differentness that Michael brought with him. Differentness they might not have tolerated among themselves, but that was fascinating in a complete stranger. It was a new note in the tune of their lives, and they came to savor and enjoy it while it lasted. They circled the fire on three sides in front of the wagon, and waited.

The tail of the wagon was down, pointing toward the fire. When he thought it was time, Michael walked out into the firelight and perched himself up on the tailgate.

"My name is Michael ap-Davis," he said. "We have a little entertainment for you, and then there'll be some trading."

Michael then launched into a monologue, detailing some of the difficulties of a roving life, but in such a way that it seemed very funny and a great good thing. The people laughed at all the right places, and even longer and louder than Michael could have hoped.

Then he said, "Come on out here, Rollo," and the bird flicked down beside him. "Where have you been?"

"I was cutting the dust in my throat over at Anders' place," Rollo said, ducking a little.

"But for *five* hours?" Michael asked, and the people laughed. Topical bits are always good. There's nothing like the familiar to laugh at.

They went on for awhile, trading jokes, and then Michael reached behind him into the dark interior of the van and brought out a guitar. He tuned it, finally running a finger across the strings and listening. "Close enough, I guess," he said.

He and Rollo sang together. Rollo's voice was none too good and needed help to carry it along, but the novelty was enough for the bit to go over. Then Michael sang alone in a true, pleasant voice, not overpowering, but easy to listen to. He finished the song by getting the people around the fire to join him in two songs.

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"For the children among you, I'll tell a story," he said, "and then they can go along home to bed." And he sat there, legs swinging slightly, the fire flickering and throwing shadows that leapt on the faces turned up to him, and he told an old, old story about a boy who sent his cat on a trading venture and lived to be three times the mayor of a great city.

When the story was done, Michael jumped down from his seat and said, "Before anyone leaves, I want to make a present to every woman in the audience of a piece of soap." He pulled a box out on the tail gate. "I guarantee that none of you have ever seen soap as smooth and clean as this before. And it's completely free. If you'll just come up here."

They came up, and one by one they took the bare, square-cut pieces of soap that Michael handed to them, and they oohed and ahhed over it. When they had moved back to the other side of the fire—none of them taking their children home, nobody leaving—everybody was standing, waiting for whatever thing Michael would produce next.

Out of the back of the large van he pulled two boards about four feet long and two feet wide. Each of them was painted in four colors, eight colors in all.

"I've got some paint for trade," he said. "Take a good look."

Fascinated by the colors, the people moved forward. Michael jumped in to stand on the tail and hold the boards upright beside him so the colors could be clearly seen.

"Will the color hold?" someone asked.

"Not forever," Michael said. "Especially if you put it on the outside of your buildings. But it'll do for a few years."

"Well, what'll we do when it wears out?"

Michael said, "I may be through this way again. That's possible. Or maybe one of you will load up a wagon and take it through the mountains the way I did. Everything I have here with me comes from south of the mountains. In any case, I've got the paint to trade now."

Another man said, "I like the colors fine, but what have we got you want to trade for? I can't see that we've got much of anything for you."

Several people nodded in agreement, not as though it were something they liked, but simply as an obvious fact.

Michael dropped the boards down on the gate. "Are the Brumagians here?" he asked.

A pair of youngish men in the crowd raised their hands. "Here."

"Do you have mirrors? I want mirrors jjust about three inches by four."

"We don't have no mirrors," one of them said.

"Well, you sell me pieces of glass a quarter of an inch thick by three inches by four, and I'll sell you paint and you can make your own mirrors. Fair enough?"

"I guess it is, at that."

Michael raised his voice. "I've got soap, paint, cotton cloth, pencils,

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paper, all sorts of things. Anders, are you here? I want liquor. I want those pieces of glass. I want some of that woolie cloth you make. If you think on it, there are probably a number of other things you've got that I can use."

Michael was engaged in active trading for several hours, making a few deals on the spot, getting more promises of deals to be made the next morning. When it was all done and everybody had gone but a last few standing around, he began closing up, feeling quite pleased with the way things had gone. At that point, a middle-aged man stepped up to him. He was just under six feet tall and he had the sort of face that becomes better looking as its possessor grows older, a strong-featured man.

He said, "My name is Samuel Adello. My daughter said you wanted to speak to me."

Michael took his hand. "How do you do, sir? I am very much interested in talking to you. If you have some free time tomorrow, perhaps I could stop by your house in the afternoon."

The man nodded. "When my daughter first told me about you, I was very interested. After seeing you tonight, I'm curious as well. By all means, stop by. I'll be expecting you."

Michael looked around. He asked, "Didn't Judith come with you tonight?"

Samuel Adello smiled. "No," he said. "She's fast asleep at home. She's completely exhausted, it turns out."

IV

The van was closed, the people were gone, the fire was out. The sky had long turned to deep black and the stars hung there like sharp specks of bright broken glass. The wind had died, but with the heat of the day and the heat of the fire gone, the night was cool. Michael sat at the mouth of his tent. Rollo perched on the end of the wagon. The darkness was great, and neither could see the other clearly, but they sat there and talked to one another's voices.

Rollo said, "All right, I stopped this afternoon. And I cooperated with you tonight, just the way you asked. Can we talk now?"

"All right."

"You know how I feel. These people are peasants. You see how they live, dirty and uncivilized. That's all right for them—they don't know any better—but why should we live that way, too?"

Michael said, "I explained what I was doing. You saw how excited they were by what I brought."

"Savages made happy by a bit of color."

"That may be," Michael said, "but what I'm doing is important. If you're my friend, you won't interfere. If you don't like doing it, I won't try to make you help me warm up the crowd. Just don't interfere. All right?"

"I *am* your friend, but we just aren't supposed to be doing this sort of thing. I don't want any part of it. Mike, won't you please stop now?"

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Michael shook his head, though in the dark it couldn't be seen. "I'm going to keep on. If you'll just promise me that you won't say anything to any of these people about who we are or what we are doing, nothing on the order of, 'Ho, ho. If you only knew what I know!', then I'll make sure if anything happens that you aren't involved. Now promise."

It took several minutes, and then Rollo said out of the darkness, "I promise I won't tell any of these peasants about who we are or what we're doing."

That satisfied Michael, but it shouldn't have. Rollo wasn't happy, and since he was the sort of person that he was, Michael should have known he wouldn't drop the matter, even if he did respect his promise.

During the morning, Michael finished making his trades and Rollo hopped around the campsite, being as bright and cheerful as you could please. He picked mites off George's back and made jaunty comments on how thick they were getting as George stamped around as best he could with the great hobbles on his legs.

Early in the afternoon, with his trades out of the way, in fact, loaded into the van, Michael walked into town and Rollo did something Michael had never dreamed he would do, probably because he had a better idea of the consequences than Rollo did.

Rollo waited until Michael had walked well out of sight, and then he popped through the two-way swinging door that had been put in just for him, and he was inside the van. It was fairly dark in there, the only light coming through the canvas that formed the top and half the sides of the wagon, and it was hot, too. Besides the piles of items to trade with and traded for, there were spaces for the tent and sleeping gear and several cupboards. Rollo flitted to one of these cupboards, hinged at the side, and worked the catches open.

The door swung back. Inside were a number of odds and ends: a tool box, guitar strings, beard cream, a pile of worked-out jokes and monologs, several plain-covered books, a black box, another box that looked simple enough from the outside but contained a number of delicacies under vacuum, a medicine kit and several more items. The cupboard was the place Michael kept his more personal items and those few things they carried that might tip off their off-planet origin. The catches that held the cupboard closed were almost impossible to work unless one knew how in advance.

The black box was a communicator, and operation of it was merely a matter of pushing a button and talking. Rollo pushed that button and began to talk to the Ship, giving them the whole story. That was one way to settle the matter and bring Mike back to his senses.

When he was done, the man on the other end said, "Thank you, Rollo. You did the right thing. We'll take care of things from here."

And Rollo signed off, feeling

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pleased with himself. He was loyal to his Ship, but in spite of all that had happened, ultimately loyal to his best friend.

Michael knocked at the door of the Adello house. The log house was tightly made and chinked, and it sat comfortably in the shade of this bright afternoon, looking coolly at ease, wearing bright curtains at its windows like flowers in a buttonhole.

Samuel Adello answered the door. "Where's Judith?" he asked.

"I haven't seen her," Michael said.

"She started out to find you at your wagon about twenty minutes ago," Adello said. "You must have just missed each other. Oh well, she'll turn up soon enough. Come on in."

He led the way into the house. Facing the door were stairs with a pole railing that led up to a low second story. There were at least three rooms on the main level, one at either hand and another behind the stairs.

They went into the room at the left. There were rugs on the floor, comfortable-looking rude furniture, and even a shelf with some books on it.

Michael waved toward the books. "The first time I saw your daughter she was sitting by a stream out in nowhere reading a book. She put it away as soon as she saw us coming."

Adello said, "There aren't a great many books around here. I'm lucky enough to own more than most people." He smiled. "One of the reasons I was glad to see Judith come home again is that she brought a new book back with her. Here, sit down."

They took chairs and Michael said, "What was Judith doing out there, anyway? She wouldn't tell me."

"I don't imagine she would," Adello said. "By the way, what do they call you?"

"Michael or Mike."

"Call me Sam. We might as well put this on a friendly basis," Adello said. "Judy was out looking for a giant."

He got out a pipe and filled it with rough tobacco.

Michael said, "How do you mean that?"

Sam lit his pipe. "Well, several ways. For one thing, she's too big for the people around here. She's taller than I am and she's taller than everybody else around here, except for one or two, and they aren't taller by more than an inch. She's too big for all the young men here. She scares them. That's why she left home. She went to the next town—there's a town about ninety miles down the trace—only she found the men weren't any bigger there and besides there wasn't any place for her to fit in there. There are only so many things a person can do, and they already had people doing them. You seem to understand the principle of the thing pretty well."

"What do you mean?" Michael knew exactly, of course, but he wouldn't say so.

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"Your wagon and your trade goods make a place for you as you go through a town. Without them, you wouldn't be welcome. As I'm sure you know. Anyway, that's why Judith came home—a lack of giants. I wouldn't be surprised to see her go off looking in the other direction in a few months."

"Are you going to try to stop her?" Michael asked.

"No, I won't do that. She'll either find what she's looking for or she won't, but I wouldn't stop her. She's got a problem, though, because size is only half of what she's looking for. She wants a man who isn't just like everyone else. Ever since she was small, Judith has had romantic ideas, and she's looking for a man who stands out, somebody who fits those dreams she has."

"Another giant," Michael said.

Sam nodded. "That's right. I'm not sure, but from the way she was talking yesterday, I suspect she thinks you fit the bill on both particulars." He took a puff on his pipe.

Quite calmly, Michael said, "If so, she's got the wrong man. I don't think she'd be any too happy if she knew what I was actually like."

"It so happens that I agree with you. Judy has very strong feelings on the subject of the Ships. That's one thing I hope she grows out of, her enthusiasms and antipathies. Living is more a matter of balances than she realizes yet. Not that I care for you people as a rule, myself. I don't."

There was a long moment of silence while Michael absorbed what Sam had said. He looked at the older man sitting quietly smoking his pipe.

Finally Michael said, "Do you mind answering a couple of questions?"

"Not at all. I think I know what you're going to ask."

"To begin with, what do you plan to do about this?" Michael asked.

"Nothing at all," Adello said. "I don't care for you people as a rule, but I have nothing at all against you. As a matter of fact, I owe you thanks for saving my daughter's life. But I would be interested in an explanation of just what you are doing."

Michael hesitated. "I don't think you'd find it pleasant to hear."

"Perhaps not, but I already have a fair idea of what you people think of us. I think I can stand anything you have to say. Go ahead."

"I'm an anthropologist," Michael said. When there was no reaction to that he settled himself in his chair and continued.

"Morrow is widely but thinly settled with a moderate but not consistent technology. Homestead has glass, but it doesn't have paper, so you make do with writing on slate. The town I was in before this one, it was the other way around, and they made their windows of heavy greased paper. I've even heard of towns where there was no metal work at all. The problem is that each community is closed, and people who are

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born there, live there until they die and they die without having seen anybody or anything that is other than just what they are used to. There isn't travel, and there isn't communication. If you had travel, trade and printing, life would be easier for all of you. I don't say more pleasant."

"So you are providing what's missing," supplied Sam.

"No, not exactly. I'm trying to make it seem attractive. In a few more years, if you people want more paper and paint, somebody will have to go get it. The thing you may not like is that I'm doing all this with a cold heart. I don't really care one way or the other about you — though I have respect for a lot of you. Your daughter for one. But there are many planets, and to me you are just one. I'm doing what I'm doing — and if my people at home find out about it, I am going to be in an incredible amount of trouble — because I want to know if one trip with a wagon can stimulate you into changing your lives."

As Michael finished, Sam Adello leaned back and looked up at the ceiling for a long pensive moment, digesting what he'd just heard.

"You're right," he said, at last. "Perhaps you shouldn't have told me. I like what you're doing, but you have me going in two directions. It doesn't feel pleasant to know you are part of an experiment. It makes me feel used."

Michael was nowhere as cold and dispassionate as he liked to picture himself. If he had been, he probably would never have mentioned his motivation in the first place since there was no need for him to be honest about it, and he wouldn't have said, "I imagine you probably have a lot of influence around here. If you wanted, you could probably wipe out what I've done here with no trouble with just a little talk after I've left."

Sam shook his head. "That isn't fair. I almost feel like putting my horse in front of a wagon and starting out myself. Mike, I just wish I didn't like you, but for some reason I do. Tell me, do you own a razor?"

Michael nodded.

Sam said, "Then you'd better use it when people are around. Judith didn't realize what that depilatory ointment, or whatever it was, that you used yesterday meant, but I did when she told me."

"I just didn't think about it," Mike said.

Sam nodded. "I was positive that didn't come from anywhere here on Morrow, and I was sure that you were from a Ship after I saw you — there were just too many odd things about you, things that simply struck Judy as picturesque. I'm sure there aren't any other people around here who know, and that's just as well. I don't think you'd be treated very well if they did."

V

Sam walked back with Michael to the wagon, interested in seeing his setup in daylight and in talking to Rollo, as well as finding Ju-

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dith, who as yet hadn't come home. They strode along, Sam almost a head shorter than the younger man.

"You'll have to approach Rollo gently," Michael said. "In some ways, he's quite . . . childish, I'd guess you'd say. If he likes you, fine. If he doesn't, he won't talk to you at all. Most likely it will be the second, because Rollo is convinced that anybody fool enough to live on a planet has to be an out-and-out peasant."

"Well, I'm interested in trying."

As they walked through town, they saw ahead an angry knot of people standing in front of the little building where Anders served his liquor. The Brumagian brothers were there and Anders and Judith among others. When the crowd saw Sam and Michael coming, they turned toward them and started up the dirt street, and as Sam had said, Judith was the tallest among them. She was hotly angry, the others angry at a lower pitch The two groups come together.

One of the Brumagians, hair tousled, shirt sleeves rolled high, said, "Judy says this Davis fellow is off a starship. Is that right?"

"I'm sure Judith never said anything like that," her father said quietly, looking at the girl.

Her face was flushed. Hotly, she said, "When I went looking . . . When I went down to the camp, Rollo, the bird, was talking on some machine to one of the Ships. He is off one of the Ships!"

Sam said, "Come over here, Judith." He stepped off to one side as the crowd moved in on Michael, taking his daughter by the sleeve.

One of the Brumagians said, "Are you off a Ship?"

Michael shrugged. "So what if I am?"

"So this." The man swung hard at Michael's stomach.

Michael stepped back and swung himself, his big fist catching the man high on the head. Then the others moved in and Michael went under a pile of tumbling bodies, the dust churned and rising around them. Michael came up once, shaking people off like a dog shaking off water. He got in several more blows before he went under again. He knew how to fight as well as most people, which means not well, but he could still inflict damage on the basis of sheer strength and size. The tangle of fighting men heaved for several minutes, and then when Michael came up again, he was dripping blood, with men holding his arms and body still.

Judith gasped. There was a stream of blood running from Michael's nose and down his lip.

"Keep watching," her father said.

Then Michael was held and methodically beaten, not the professional sort of beating that cracks the spirit open, but a good solid beating that hurt, cut his face, blackened his eyes, bruised his ribs, and left him weak and aching, his face red and bloody. Then they let go of him and he dropped to his knees. He hadn't made a sound during the beating and neither had the men taking turns hitting him

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except for grunts of breath and one man crying out as he hit wrong and hurt his hand. He had moved aside and somebody else had taken his place while he nursed his hurt. It was all done in deadly silence.

When Michael went to his knees, he was kicked hard. "Get up."

Judith looked away, her eyes filled. "I didn't mean this to happen," she said painfully.

Samuel Adello said, "This may teach you to think about consequences. Come on along." Judith hung back, but he took her arm and made her follow.

Michael, on his feet, was shoved stumbling down the road toward his camp. He was prodded, knocked off his feet, kicked until he was up, and then shoved down again. Sam brought Judith, resisting dumbly all the way, as the crowd followed Michael to his wagon. Rollo was nowhere in sight.

Anders, blood on his knuckles, yanked up the little tent, and it and Michael's sleeping gear were just jammed into the back of the wagon and the gate was slammed again.

"All right," Anders said. "Hitch up that tite and get out of here. If you ever come back, you can expect the same sort of treatment, and that goes for any of your other friends. We don't want any part of you, you lousy scum."

Michael painfully hitched up George, favoring his aching ribs as best he could. He took off the hobbles and dropped them behind the box, ignoring the hostile eyes watching him all the while. Finally he dragged himself up to the seat and slowly drove away, not saying a word.

The crowd silently watched him go until the wagon was out of sight behind the first rocks in the notch. As soon as the wagon started to move away, Sam put his hand on his daughter's shoulder.

"Come on home, Judith," he said. "I have some things to say to you."

And they separated and walked away from the still-rapt crowd intent on the van rattling off in the other direction.

When the wagon was in the notch and out of sight of the town, Rollo circled from a perch on the high rock wall and fluttered down to the van.

Mike turned a bloody face to him and said reproachfully, "You just had to talk to one of your friends, didn't you?"

The little ship came buzzing down into Homestead like a self-important bug and, casting a long shadow, settled down in the middle of the main street. That was in the late afternoon when Michael ap-Davis had been gone for several hours, when the clouds overhead, dark and angry, were closing in from the east and the sun seemed to be snuffed out between the pinching fingers of the clouds and the horizon. The ship was a tapered bulb about twenty feet long and perhaps ten feet high at the front end, narrowing smoothly back to a rounded rear on which steering

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vanes were placed, and it had much the look of a bug trying to impersonate a whale.

When Sam Adello and Judith had reached their house, Sam had said, "Sit down. We have some things to discuss."

Judith sat down numbly, avoiding his eyes.

Sam said, "I never thought I'd have to say I was disappointed in you, but this time I am. Didn't you think you owed a man who had done you several favors, including the strong probability of having saved your life, at least the chance to speak for himself? It was only yesterday that you sat in the same chair you are sitting in now and told me at considerable length what a fine person he was."

"But then I found out that he was from one of the Ships," Judith said miserably.

"He didn't change between yesterday and today. The only thing that changed was what you knew about him. As it happens, I like Michael ap-Davis. I think he has a lot to recommend him."

"I didn't want anything so bad to happen to him, but he's from one of the *Ships*."

Strongly, Sam said, "Judith, you know nothing at all about the Ships! They don't present a united front of evil. Michael is more of an individual than you've just shown yourself to be, because he doesn't depend on Jacob Brumagian for his opinions. When you let Jacob do your thinking for you, you have no right to feel unhappy when he does something about his thinking. Now if you'll listen, I'll tell you a few things that you don't know."

And Sam proceeded to tell Judith what he knew of the Ships, and what he knew of Michael and the things he was doing, including the trouble he might be making for himself. He talked at length and in detail, telling what Michael had said of himself, and telling what he knew of the Ships from other sources — not a lot, but not all unfavorable, either. And he gave his own opinions and thinking, too. Judith listened silently to all that he had to say.

When he was finished, Judith said, "If only there was some way I could begin to make up for what I've done."

"I don't think there is," Sam said. "This may be something you'll just have to learn to live with."

Afterwards, Judith went quietly to her room. Lying on her bed with the light coming through the small high window, she cried, and then, wiping her eyes with her shirt sleeve, she just lay there thinking, looking at the low slanting board ceiling above her. Without realizing how it happened except that she was suddenly tired, she finally drifted into sleep. She was wakened by the ship landing in the street.

She got off her bed and went to the window in time to see the ship settling to a rest, shining brightly under the darkening sky in the last glint of the sun. When she reached the street, her father

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was already there, standing outside the house looking at the machine. She joined him. There were curious faces all around, but at a considerable distance.

It is one thing to know of machines like this, to have heard of them, to have read of them, but it is another to actually see one, small but still looming larger than one could guess, making its own peculiar high-pitched buzz that became a shriller whine at close range. It was a sight to shake one, and Judith wondered what effort it would take to become used not merely to one machine, but to being surrounded by more and less complicated machines of every sort and complexion. For the first time in her life she seriously entertained the thought that in truth the people of the Ships might be of a different and higher kind than the ordinary people she knew. If she had never known what machines were, she might have taken this one in stride more easily — the trouble was that she had *thought* she knew and now she found how wrong she had been. She discovered that the easy acceptance of machines in the books she had read had tricked her imagination and left her unprepared for this moment. She would have stayed where she was and never moved closer, but Sam walked forward toward the machine, and feeling that to stay would be to fail him again, she followed.

And then suddenly whatever sense of mystery and awe she had disappeared, for out of a door in the larger end of the little ship

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stepped a young man whose appearance alone was enough to cause any machine he might operate to be demoted immediately to a simple tool. He wore arrogance like a suit, but his appearance alone said that his arrogance was not that of the ideal fellow whom Aristotle described so long ago, but that of a lightweight cherishing the idea that he was among people not fit to touch, people who damned well ought to realize the fact and do their best — though bound to fail — to propitiate him.

He was of medium height, and shaped like a pear — scrawny on top and bulbous on the bottom. His hair was teased into a brown pompadour that marched back in successive waves from there, like a washboard run wild. He wore shorts around his sloppy hips and a loose shirt hung limply around his sunken chest, and there was a gun of some sort stuck in a belt at his waist, looking like a wart on the side of a watermelon. His face was porcine.

He pointed at Anders, standing on the board porch in front of his store. "Hey, you. Come here."

Anders spat in the dirt of the road. "Not likely."

"I want to ask you some questions, fellow."

"Ask anything you want," Anders said noncommittally.

The man said, "I'm looking for a man with a wagon pulled by some sort of large animal."

"Lots of horses and wagons around here. Horse is large."

"Not a horse. And there's a talking bird with them."

"Nobody like that around here."

Angrily, the pear-shaped man said, "I *know* they were around here."

Anders shrugged. "If you know the answers, why ask any questions?"

The young, pear-shaped man flushed hotly. "That man you are protecting is a dangerous criminal. I've come down here to see that he's taken back to the Ship to get the punishment he deserves."

Judith looked at her father in alarm and started to speak, but he motioned her to be quiet, shaking his head.

Anders looked interested. "And just what did this fellow you keep talking about do?"

"He traded with you. He wasn't supposed to do that."

Anders shook his head. It was funny to see these two men standing at a distance from one another, neither willing to move under the eyes of the town. "I'm sorry, mister, but that just doesn't fall into what I think of as a dangerous crime."

"You're protecting this man. I can make you tell me where he is," the bulbous young man said.

"You going to shoot me with that gun you've got stuck in your belt?" Anders asked blandly.

Impatiently, Judith took her father's arm. "If I start after Michael right away, I can warn him," she said. "Should I go?"

He looked at her in gratifying approval. "All right," he said, "and

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I'll try to see that this fellow doesn't get his machine off the ground before dark. Good luck, Judy."

She bobbed her head once quickly, turned and was gone immediately behind the house and into the trees. She had her regular walking shoes on, good and strong, and pants and another rough shirt. She ran, long after she was out of sight of the machine. She ran until she was among the first rocks of the notch and starting the climb after Michael and the wagon, and only then did she slow down to a walk. Soon after that, it grew dark, all the darker for the clouds overhead, and from time to time there came the sound of thunder as a distant but distinct low muttering.

VI

Michael heard the thunder, too. Before the fall of night the van had rolled up out of the long rocky notch onto the grassland above. Rollo had been right — at least at the head of the notch, the land was not level but slanted down sharply enough to make one think of a funnel with the notch as a tube leading down. They might have continued on, but night was coming and Michael was in no mood to drive further. They pulled off the road — which had been reduced to a trace again — and found a place to camp among a nest of rocks.

After they had entered the cleft at the bottom, Mike had stopped. The first thing he did was wash his face and patch some of the cuts. One of the things he had inside the cupboard in which the communicator was kept was a medical kit and after using it, he only looked as though he'd had a minor but unfortunate encounter with an angry bear. He then straightened up the gear that had been simply dumped in the back of the wagon, put up the gate and closed the doors, and then they continued on.

Rollo watched all the time Michael was cleaning and straightening up, perched on one of the open doors at the rear, and then when Michael closed up, he moved up to his pole. He was being careful about what he said because he knew Michael was angry, and he knew if Michael found out why he had called the Ship, he would be even more angry. Rollo didn't really care what happened as long as he could keep Michael from being mad.

He did say, not so much in self-excuse as in an attempt to change the subject to grounds more comfortable for him, "See what you get from these peasants when you try to do them a favor? I told you we couldn't trust them."

Michael didn't say anything, merely flicked the lines. George threw his weight into the traces as the slope upward increased. The cleft in which they traveled was strewn with many great boulders. It was as though some cosmic maker of sandcastles had seen the empty fissure and started to fill it with sand, but then had gotten distracted and gone on to something else after pouring in only part of the first

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handful. Those few grains of sand were the great boulders between which they passed. Almost from the beginning there was no clearly defined road, merely many little paths that the woolies and whatever else traveled here had taken in picking their way round the rocks. Michael had to watch carefully where he guided the wagon to avoid paths that suddenly pinched between two great and sudden boulders.

Rollo's words were just left hanging. Unfortunately, he said, "Well, now that the experiment is ruined, can't we go home?"

Michael continued to drive. After a minute, he said quietly, "The experiment's not ruined. They threw *me* out — not the things they traded for. Besides, that was only one town."

They were at the top easily an hour before dark, before the sun set. Michael picked a protected spot in a circle of great rocks where the remains of past campfires showed that others had stayed, and he set up camp there and prepared a meal. He ate sitting on a folding stool, his plate resting in front of him on the tailgate of the van.

Last light had gone from the valley below them by the time he finished his dinner, though it hadn't yet faded up here on the plateau. It slanted redly across the dark clouds above and turned the grassland to red-gold. Michael's eye was caught by dark shapes on the slope well above them. He looked long at them until Rollo noticed his gaze and hopped around to look.

Michael said, "Rollo, your eyes are better than mine. Are those titanoths up there?"

Rollo looked closely. "Yes," he said at last.

The animals were moving in long restless patterns, perhaps made nervous by the distinct rumble of thunder from the east.

"I don't like the way they're acting. Would you fly up there and take a look at them."

"Right."

Rollo launched himself into the air and was gone with a flutter of wings. Mike watched him as he circled high towards the clouds until he was lost to sight beating strongly toward the animals perhaps a mile away up the grassy slope. He was out of sight for nearly ten minutes as the darkness increased, and then he was back, obviously disturbed.

"You couldn't offer me anything to stay among those animals," Rollo said. "They're skittish, and all of them honking and moving around. They look as though anything at all would set them off like that bunch we saw three days ago."

Michael said, "Did you notice whether or not they had many of those little white mites you're always picking off George?"

"You couldn't miss that. They're swarming with them." He clicked his bill. "I even got a bit of dessert."

Michael nodded. "I think that's what sets the titanoths off. I looked over one of the bodies we came to the other day and some-

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thing had been boring into its hide, and I thought then it was probably those mites since we hadn't seen them before we came over the mountains. If these mites are cyclical, that would explain why the titanoths are so long between periods of going berserk."

Then a thought struck him, and he said, "There aren't any large carnivores around here. Maybe it keeps their numbers down to reasonable size."

Rollo said, "Hadn't we better move the wagon out of the way?"

Michael looked long up the hill where the titanoths were now lost in the gloom, and then he turned and looked downhill toward the notch.

He said, "Let's get packed. If those titanoths do stampede, they're going to funnel right into the notch and out again at the bottom on top of the town. We're going to have to warn them."

"Warn them? After what they did to us? I say it serves them right if they get mashed flat!"

Mike said, "We still can't let anything like that happen to them."

"We don't owe these peasants anything," Rollo said. "Besides, you could never get the wagon through at night like this."

"You're right," Michael said, stopping in the middle of taking the tent down. "We'll just have to chance things with the wagon and hope the rocks here will keep the titanoths off. They should go right on by us and down into the cleft. It's the easiest way for them to go. I'll just take George."

"You can't go," Rollo said. "If I talk to George, he'll never take you anywhere. You know that."

For the first time, Michael looked seriously at Rollo. "I thought you were just grousing again, but you're not, are you? Would you really keep me from taking George?"

"Yes," Rollo said flatly. "If it's the only way to make you see reason, that's what I'll do. I'm sick of this place, and I'm sick of these horrible people. I've had it. I want to go home. Nothing will happen to those peasants that wouldn't happen to them anyway."

Angrily, Michael said, "I'm going down if I have to walk."

"Well, walk then!"

Michael turned his back abruptly, passed between two rocks and was gone in the dark, headed downhill through the knee-high grass. Rollo looked helplessly after him, as though expecting him to come back and say he was really fooling, but Michael didn't come back and Rollo didn't call after him.

In three minutes, Michael was in the notch, starting down a far more abrupt slope studded with rocks invisible to him in the dark. He had no idea how much time he had, or indeed, whether he might not be on a fool's errand. All he could do was make the best time he could, get to the bottom, give his story, and hope it didn't earn him another beating. If he was wrong, that was the least he could expect. If he was right, Homestead might well be totally destroyed, and nobody would be likely to thank him for that. If he was

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right and he was without luck he might well be caught himself here in the fissure and be trampled to death before he had a chance to climb to safety. He kept his ears cocked for the heavier and closer thunder behind him that would warn him to look for shelter, a climbable rock, anything, and he moved on at a pace that was a compromise between his best speed and a safe downhill momentum.

It was very dark inside the notch, but no night is completely black, even under thick clouds on a moonless world, and Michael was able to see well enough that he didn't break his neck. He turned an ankle slightly once when his foot came down at a bad angle on a half-sunk little rock, and he scraped his thigh ricocheting off an unexpected boulder.

It had taken a full three hours for Michael to bring the wagon to the top of the notch. It took him barely an hour to come down again in the dark amidst the sound of closer thunder, though not the thunder he was prepared to hear, and hoping wouldn't come. Lightning streaked the clouds and a trouble-filled wind pushed at him in snappy little gusts.

When he reached the bottom, Michael threw himself to the ground and gasped to catch his breath. With his sides still aching from the beating he'd undergone, each breath was a painful effort. After a minute, Michael raised himself onto his hands and knees, and then pushed himself to his feet again. Weaving slightly, he followed the road toward the lights of Homestead.

He came up the slight rise that led past the campsite he'd left only hours before and saw in front of the first house at the edge of town nearly as many people as had come to hear him the previous night. They'd apparently used the wood left over from last night's fire to build another fire tonight and there were men and women standing close around, all listening to Anders speak.

Michael took a deep breath and walked through the dark toward them. When he came close, he was seen.

"Hey, here's another of them. That Davis fellow's back."

Men turned toward him, and Michael saw they had guns and looked angry. Michael held his hands up at shoulder height, palms out, to show he meant no harm and several men rushed forward to seize him roughly. They hustled him forward unresisting up to the fire.

Anders said, "We told you not to come back here. You damned Ship-people!" He pointed down the street. "Come back to join your friend, did you?"

Michael looked where he was pointing. Far down the street, one small light burning, was the shape of a small overturned bug flyer. Sitting beside it in the dirt and watching them around this fire was a figure he couldn't make out.

"I don't know who that is," he said, "and it isn't important. I must speak to you, Anders, and to Sam Adello in private. I've got something essential to tell you."

"You want to see Sam Adello?"

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Anders asked. "All right, we'll show him to you. Bring him along there."

Anders turned and led the way away from the fire and into the first house where lights could be seen burning through the windows. The men at Mike's arms shoved him along behind, but Mike moved at a sharp enough pace that the men were closer to hanging than to pushing. Michael had almost recovered his breath fully by now except for a raw feeling in his throat and lungs. He followed Anders with a will, wanting to get this thing cleared up and the people out of danger as quickly as possible. Sam Adello seemed the one person he could count on to have any influence and still hold his bare story worth something.

Anders opened the door to the house and the men holding Michael let loose of his arms to allow him to follow Anders in. The two of them crowded in behind, watching Michael, and closed the door.

"He's in here," Anders said, and opened the door to a room. He stepped aside.

Sam Adello was lying on a bed there with bandages covering his arms and most of his upper body with white. His face was covered with sweat and gripped in pain.

Bitterly, Anders said, "That's what your friend did to him."

"What happened?" Michael asked in a low tone.

"We tipped that big flying machine over and that young fellow shot Sam with some sort of flame. He's all burned."

Michael moved closer to the bed and Adello saw him. His eyes were open, though brimmed with pain.

Sam said questioningly, "You came back?" Then he reached a hand out and seized Michael's arm in a surprisingly strong grasp. Fiercely, he asked, "Where's Judith?"

"Where did Judith go?" Michael asked.

"She started out after you hours ago," Adello said with effort. "Warn you. There's a man here from your Ship to stop you and take you back. I . . . I stopped his machine to give you time."

Michael said, "Don't try to talk. But listen. I must have passed her in the rocks and the dark on my way down. The reason I came back is that there is a herd of titanoths up on the plateau and they're ready to stampede at any moment. When they do, they'll come right down through the notch and right through Homestead. You've got to move now back out of the way along the valley wall where they'll go right past."

Sam said, "But Judith . . ."

Anders said, "And how would you know the titanoths are about to stampede?"

To Sam, Michael said, "If Judith started out more than a couple of hours ago, she's probably clear at the top and safely out of the way. I hope so."

Again Anders said, "How would you know?"

Michael started to answer, and then stopped. Finally he said, "It's

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complicated and you wouldn't believe me if I told you. I do know. When I saw them last, they were ready to go off at any moment. You have not time to lose to get clear. They'll smash the town flat."

One of the men in the hall behind Anders said, "Why should we believe you? How do we know you aren't pulling some sort of funny trick?"

In exasperation Michael demanded, "What kind of a trick could I be pulling?"

"That's exactly what I want to know," the man said.

Sam raised himself slightly from the bed and said, "I believe him. Would you move me out of town?"

"We can't," Anders said. "Sam, you aren't up to being moved."

Painfully, Sam got a foot out of bed and on the floor. "I'll walk if I have to."

Anders moved forward quickly to put a restraining hand on him. "All right," he said, and Sam fell back. "We'll move you. We'll all move." He turned to Michael. "But if this doesn't turn out exactly the way you said, mister, I'll personally take it out of your hide."

Michael nodded. "Fair enough. Now I'd better go tell whoever it is with the bug about the titanoths. He's going to have to get out, too."

"Oh, no," Anders said. "You aren't going anywhere I can't keep an eye on you. If we move, you're staying with us every minute."

"Let him go," Sam said weakly from the bed.

"Oh, hell!" Anders said. "Oh, all right. Go wherever you damned well please and good riddance to you. Just don't let me see you again. Get out of here."

Michael started out of the room. Anders said, "Bill, go bring a wagon around here to put Sam in. Load him in and take him out of the way." And he followed Michael out.

Outside, Michael quickly pushed through the crowd. People looked questioningly at him and several made as though to lay hands on him. Anders said, "Let him go. Listen, all of you. We're leaving town, all of us, for a few hours at least."

Mike could hear the voices rising in protest and question and Anders answer them, as he moved down the street toward the lonely little light. The last thing he heard clearly was Anders saying, "Because we have no choice — if he's lying, we lose nothing, and if he's right, we'll all at least come through alive." Then the voices faded away in the night behind him.

As he came closer to the flying bug, he saw by the dim light that it had indeed been overturned and would have to be righted before it could be flown. It struck him as odd that such a large and complicated machine, made of metal impervious to all slings and arrows, unbreakable, impenetrable, could be so easily put out of commission, but yet, there it was with its pilot sitting beside it in the cool dirt of the street and looking up the way to the other light and the people around it.

It must have been that Michael appeared as looming suddenly out

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of the darkness at him, for the pear-shaped young man jumped to his feet and pulled out the searing gun at his belt. Michael recognized him then: a nonentity named Fritz Herman.

Fritz pointed the weapon at him and said, "Stop right there! I see you. You can't sneak up on me."

"Oh, put that gun away, Fritzie," Michael said. "We don't have any time for that now."

"Ap-Davis! I've got you. You're my prisoner." Fritz pointed the wide-nosed gun at him like a hose nozzle. "I've got you!"

"Oh my God," Michael said tiredly.

Judith reached the top of the cleft at almost the same time that Michael reached the bottom. She was much less winded because she had been traveling much less urgently, though the muscles in the back of her legs did ache. She paused at the top to rest for a moment where the rocky notch met the edge of the grassland, the grass reaching above her knees. There was a breeze up here in the open, a little wind that was sharp and nasty considering the time of the year. An odd gust brought a slight tingle of cold rain and lightning flashed somewhere in the rocky jumble of highlands far above, showing the lean line of the trace stretching away.

She looked around to catch what bearings she could in the dark. She expected to find Michael close by, thinking he wouldn't have traveled much farther before dark. If he had, she would have to continue along the trace until she found him, since it was truly necessary that he be told before morning of the man trying to capture him. She sighed and hoped he wouldn't be far away in this night that promised her a soaking if she didn't get under cover.

She sighed again and started forward, and then she saw the faint red glimmer of a dying fire off to her left across the grass. With a feeling of relief, she turned off the trace and began walking through the grass. Soon she came on twin lines of matter grass where the wagon had turned off, and though she lost sight of the fire for occasional moments, she followed the wheelmarks, knowing she was in the right place.

She found the fire and the wagon in a nest of rocks. George was there, hobbles on his legs and tethered, moving restlessly. The fire was low, a nest of coals and little more than that, and neither Michael nor Rollo was to be seen. The tent that Anders had shoved in the back of the wagon was lying on the ground half-pitched. Judith called, but there was no answer. She leaned over and looked under the wagon, then opened up the back of the van, but nobody was in either place. Puzzledly she turned all around, looking the camp over.

Rollo flew in then, landing on top of the van. Tartly, he asked, "What are you doing here?"

"Where's Michael?" she asked.

"He's gone down to that horrible town of yours."

"Oh, no," she said. "I came here to warn him not to come back. He

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shouldn't have gone. There's a man from your Ship looking for him to take him prisoner."

"Not 'prisoner'," Rollo said positively.

"Well that's what the man said. He has a gun and he says Michael is a criminal and is going to be punished."

"You . . . you're not serious, are you?" he asked, frightened and incredulous.

Judith nodded her head.

"What have I done?" Rollo asked slowly out loud. "Oh, damn me!"

"What is it?"

"Nothing. Look, Michael went down to warn you. There's a herd of titanoths just above us that are ready to stampede at any moment, and when they do they'll go right down through that pass we came up and right over Homestead."

"Titanoths?"

"Yes, I was just up there. I thought they were bad before, but right now they're primed. They're like one of those old bombs with a string fuse that you light, and they are lit. They're going off any minute. Listen and you can hear them."

Judith strained into the wind and heard again as an undertone the drumming thunder she'd heard before, and it chilled her.

Rollo said, "They haven't started running yet. They're just moving around in circles, and just with that, they're shaking the ground."

Judith said, "I'd better go home. They may not believe Michael. They may just beat him up again, but they will believe me. I've got to go."

Rollo shook his head. "You can't go," he said. "You'd never have time to make it. They'd catch you before you got to the bottom and run right over you."

The girl looked around desperately and her eye lit on George, looming large by the wagon. She let loose an explosive breath, and then she said, "I can ride George." Her stomach tightened and she shook her head, but she said, "I can *ride* George."

Rollo looked at her and then, after a long moment, he said, "All right. And I'll come along."

"No," Judith said. "Stay here and when they start to run, come down and tell us. It may give us just enough time to get clear."

"All right." Then from the wagon top, Rollo popped down to George and started one of his private conversations and George settled down.

Steeling herself, Judith forced herself to kneel by George's great round feet and took off the hobbles. Then she took up the tether and led George over by the wagon. With one hand, she let down the tailgate and swung herself up on it. She stood up, still holding George's lead line.

Rollo left George then and went to the van top, right by Judith's head. "Good luck," he said.

She nodded as bravely as she could, then leaned over and legged up on George's broad back. "I hope he operates like a horse," she said. She wapped him lightly with the flat of her hand, and he started off.

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He headed where she pointed him and increased speed, and she concentrated on holding on. Holding on. Holding on. As they entered the notch and started down she wondered what she would ever do if she fell off. Feeling like a flea jockey on a dog's back, but without the purchase, she spread her arms and legs wide and pressed close with as tight a grasp as she could manage. And George pounded downhill.

Michael sat in the middle of the dirt street that ran through Homestead and looked out at the darkness all around. Just above his wrist there was a double band, connected by another strip of the same leatherlike material, and attached to that strip was a long lead running inside the upward-turned open door of the tipped-over bug and secured firmly there. Michael dribbled dirt out of his palm and silently cursed himself, cursed Anders, cursed everyone he could think of, but most of all cursed the knothead standing beside him.

When he came up, Michael had said, "Put the gun *away,* Fritz. Now listen. Around here they have herds of great animals that periodically go completely crazy and stampede, and they run right over anything that gets in their way. Not far away there's a large herd of these animals and they're about ready to stampede, and when they do it will be right over this town. Now we've got to get out of here."

Fritz snorted. "What kind of a fool do you think I am? I don't know what you're up to, but it doesn't have a chance of working. Don't make things worse for yourself by trying some silly trick now. If you do, I'll just have to put it in my report and it'll be the worse for you. I know you hate me, but I'm not going to give you a chance to do anything about it. Hold steady there."

The bulge-hipped young man pointed the gun straight at Michael and reached inside the overturned bug. He came up with a lead and a restraining band, attached the lead inside the machine and then advanced with the band.

"Hate you?" Michael asked puzzledly. He had never particularly thought of Fritz one way or the other, and certainly not with hate.

"Of course," Fritz said. "I've seen how you looked at me, you big ape. Don't think I haven't. The way you swagger around as though you own the world, as though you really counted for something. Why do you think when they wanted someone to pick you up, I volunteered? I wanted to see you get what's coming to you."

Michael said, "I don't hate you, Fritz. Now look up the street. The fire is gone. The people are leaving this town because they don't want to die here. For God's sake, let's get out of here, now, while we can."

Fritz said, "Give me your wrist." When Michael didn't move immediately, Fritz jabbed him with the gun. "If I have to, I'll kill you."

Mike presented his wrist. Fritz clipped the two leathery bands

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around the narrowest part of the forearm, just behind the wrist. On the strip that connected the two bands were three flat studs, the combination to the cuff.

"You'll never get out of that," Fritz said, "Unless I let you out, so you might as well just sit down and wait until morning. In the morning, I'll make some of these peasants help me turn the bug right side up."

Michael turned and looked on down the street. There were voices and lights moving away. There had been lights in the rough houses, but not now. As he watched, he saw the last of them wink out. The wind was getting sharper and the streaks of lightning and growls of thunder that had punctuated the sky and the night were much closer now, and the people were leaving Homestead.

He turned back and said, "Let's try to turn the bug the way it should be. Maybe we can do it."

Fritz shook his head. "I'm not going to let you loose no matter what you say."

"Damn it! You don't have to let me loose! Just get on the other side and push up as I pull down over here. Now go."

As thunder rumbled overhead, Fritz looked up. Then he shrugged, probably thinking he might keep from spending a miserable night in the rain, and went around to the other side of the machine.

The bug was lying on its long rounded side, and it rocked as soon as Michael tested his weight against it. It moved.

After a moment, Fritz said, "I'm ready."

"All right," Michael said. "When I say 'heave', push as hard as you can. Okay — *heave.*"

Michael threw his entire weight down as hard as he was able, using all his strength. The machine rocked in the right direction, but it stubbornly refused to go up on its feet. It would only go so far, and all Michael's straining would not make it go farther.

After a long minute, poised at its farthest point, the bug suddenly sagged back and Michael let go.

"I couldn't push any more," Fritz said from the other side.

"Give it a moment and let's try again," Michael said.

And they did try again after a short rest. Michael wiped his hands on his pants and signaled Fritz to push away. The bug didn't even move as far as it had before. It was on its most stable side and it stubbornly refused to be put in any other position. This time Fritz was trying only half-heartedly and gave up much sooner, grunting with effort for effect, but quitting very quickly.

"It's no use — the machine's too heavy," he said. "It was a whole pack of those people that turned her over in the first place. I shot the leader and beat them off and I would have made them turn the machine back up, but it got dark. We'll just have to wait until morning."

"We can't," Michael said. "We don't have the time. We have to leave now."

Fritz shook his head tiredly, coming around the front end of the bug.

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"Oh, please. Don't you know when to quit?"

Mike slumped down in the dirt disgustedly. He yanked the cuff and the line savagely, but it didn't snap. Fritz laughed at that. Mike picked up a handful of dirt and silently cursed.

Very shortly, it began to rain, a steady hard-blown mist. The last lights in Homestead were gone and they were left alone in the rain and the silence. The light shining from inside the bug might have been the only light in the entire world and they the only people. There was noise from the wind, noise from the splattering rain, noise from the thunder that still rumbled above, but that was the noise of an empty world.

"What was that?" Fritz said suddenly.

Michael cocked his head and listened. A heavy lumbering tread, galumphing slowly down the street. He sprang to his feet, his heart pounding.

"It's a titanoth," he said. "One of those animals I was talking about."

"Alone? Not in a great herd?" Fritz asked sarcastically. He stepped away from the machine, drawing his weapon and peering out into the darkness. The rain abated slightly. "I hear you there. Don't think I don't."

The heavy feet picked up in pace, sounding loud, pounding hard, and then suddenly in the ring of light was great George, Judith clinging to his back, charging down on Fritz Herman. Desperately, Fritz pulled the trigger and a flare of flame jabbed out. George honked in pain and ran right over Fritz, drumming him into the ground. He pulled up almost immediately and turned back. Judith slid off his back as George continued on back to stamp on Fritz again, hanking angrily.

Michael said, "Thank God for you."

Judith said, "Come on. We have no time. I could hear them behind me as we came down through the notch."

Michael held up his wrist. "It takes a combination to open this and I don't have it. Where's Fritz's gun?"

They looked for it, and after a moment there it was, in broken pieces lying in the mud on the street. Michael looked down at his right hand and swallowed hard. There was only one thing left for him to do.

"Can you find an ax and a short stick?"

Judith nodded.

"All right, go," Michael said.

Judith turned and was gone. Michael felt a trembling faintly in the earth beneath his feet. Quickly he unfastened his shirt, ripped it off, tearing the sleeve to get it off his restrained right arm. He set his hands against the edge of the shirt and ripped, feeling the rain on his bare skin as he did. The shirt was wet in his hands. He tore off a strip six inches wide and more than a foot long. He bunched it and tied a knot in the ends around his arm,

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working awkwardly but as swiftly as he could. He moved the strip of knotted cloth up above his right bicep and then Judith was back from her house with ax and stick. He took the stick from her hands and slipped it under the cloth.

"Shall I chop that line?" Judith asked.

Michael shook his head. "You can't," he said quietly. "It won't cut."

"Then what?"

Michael held up his wrist. "This."

Judith gasped. "Oh, no."

Michael nodded. "Yes." He began turning the stick, tightening the cloth about his arm.

"Let me try to cut the line," Judith said. She picked it up and Michael watched as she set it down flat on the machine and he held steady, careful not to move it, as she lifted the ax and brought it down sharply. It rebounded high from both metal and line with a sharp *chinking* noise.

Michael said, "Give me the ax."

Judith said, "You can't do it. You'll have to hold the tourniquet tight. I'll do it."

The drumming of the on-rushing titanoths was louder, a dull, heavy sound in the night. Suddenly Rollo was there, touching down.

"Quickly," he said. "There's only a minute or two."

"Can you do it?" Michael asked Judith.

Silently she nodded. Michael lifted his bond-held arm and set it on the machine. He tightened down on the tourniquet and braced himself.

Rollo said, "No!" It was more an exclamation than a protest.

Michael said, "There's no choice."

Judith lifted the ax high again. There were tears on her face mixing with the rain. She brought the ax down as hard as she could and it made a dull noise. Michael gasped, and then pulled the stump of his arm loose, free from the bands. His hand, cut at the wrist, fell away. With all his strength, Michael clamped down the tourniquet with his left hand.

Judith turned away without looking at him as Michael sagged. She dropped the ax and moved over to George standing just down the street, at a loss after killing Fritz. There was a seared patch on his front and he limped slightly as she led him back. Michael painfully boosted himself up on the machine and then to George's back as Judith held him steady.

"Go," she said and swatted George on the flank. George lumbered down the street, Michael barely holding on. Rollo launched himself into the air, following, and Judith began to run.

The charging titanoths were near, the air filled with the sound of their coming, crashing as they rolled ahead, breaking what lay in their path. Homestead began to be destroyed.

George, Rollo at his ear, moved at an angle to their coming, back toward the valley wall, between houses and out of the town, Judith running after. She fell to her hands and knees, got up, and ran on.

Again they lived by a factor of

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seconds. They stopped by the valley wall, Judith coming behind and joining them as George came to a halt. Michael put his leg over and slid down on his front.

He turned to Judith, shook his head slightly as though to try to clear it. He said, "Thank y . . ." and fell forward onto his face.

VIII

The morning was clear and cool with bright sky above. The people of Homestead gathered and looked at the remains of their town. Several houses were completely destroyed, reduced to scattered rubble. Some were partly gone, posts down, hitching racks gone, privies destroyed, sheds trampled under. The boardwalk was gone. One house was still standing, but knocked askew, its logs twisted around as though some giant hand had held it at the bottom while another hand twisted it at the top. That it stood at all was a freak, and it fell down as soon as a loose log at the bottom was touched. The woolie pens were down and there were many of the animals lying dead with the rest scattered over the countryside, a job for later. The bug was scattered, some pieces of it being carried as far as four or five hundred feet. The remains of Fritz Herman were unidentifiable.

There were three or four houses in the town that were for all intents intact, and Sam Adello and Michael ap-Davis, a night's exposure having done them no good, were carried to one of these. The rest of the town was a shambles and the people grimly set about salvaging what could be salvaged.

Judith and Rollo made one more trip up the notch to the wagon. They took George along, hitched him up and brought the wagon down. Rollo directed Judith in using the medical kit. Michael and Sam were suffering as much from the effects of shock and exposure as from their injuries proper, and it was doubtful for a while that either of them would live. But they did. Rollo and Judith stayed there until it was sure that they would, neither of them particularly happy with the other's company, but both intelligent enough not to make recriminations, intelligent enough to make the best of the situation. They had ample opportunity to talk.

On that first day of waiting, Rollo said to Judith, "You're going to have to call the Ship."

"What do you mean?" she asked.

Rollo said, "If you want to settle things now, you'll call the Ship and tell them that the bug, and Fritz, and Michael were all destroyed."

"Michael?"

Rollo nodded, the little bird head bobbing. "Yes. He was killed by the titanoths. Now is the time to talk to the Ship while it is still unquestionable that the town was destroyed."

"Why can't you tell them?"

Rollo looked at Michael's unconscious body in the bed, the end of which he was perched, but he didn't look at her.

"I can't go back," he said. "Tell them any old story you can think

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of. Tell them I flew off in grief. They'll have to believe it — they don't have any choice."

"But you can go back," Judith said. "You can go home again. You don't have to stay here."

Rollo looked at Michael again. "Sometimes you can't do the easy thing," he said. "Oh, how I wish I could."

Months later and hundreds of miles away, there were two wagons on the road, one pulled by two matched horses, the other pulled by a brown titanoth. The first was a van with a white canvas half-top, the second a conventional four-wheeled covered wagon. Just behind them was a town. They traveled along after they left it, one after the other, and stopped finally at a crossroads.

As they were recovering, lying in beds in the same room, Sam had told Michael of his determination to become the second long-distance trader on the roads. "Why not?" he asked. "There's no real reason to stay here, and it's worth doing. If you can give us some coaching, Judy and I should be able to get along."

Michael nodded. "All right," he said. He held up the metal hook in a leather socket that the blacksmith had fashioned for him. "By the time we're well enough to leave, I should have the hang of this thing."

Since they'd left Homestead, they'd passed through two towns and Michael had coached them and helped them to develop their own routines. "The things you have to trade are ninety per cent," he said. "You don't have to be very funny or be able to sing well."

And now they were separating.

Michael ap-Davis hopped down from the driver's seat of his van and walked back toward the halted wagon behind. Judith got down and came forward and they met by one of the great wheels of the van and began talking quietly. Rollo looked at them and then flapped back to the wagon to talk with Sam. Sam was smiling when he got there.

"I know what you're thinking, and you're wrong," he said to Sam.

"What am I thinking?"

"You think Judith and Mike are in love, but you're wrong. You're going one way and we're going the other. That should settle things. Your daughter's lost her chance."

Sam said, "Maybe and maybe not. Sometimes it takes a while to find out what you think. I believe my daughter's made up her mind and if she has, a little distance isn't going to make much difference. I don't know exactly what Mike is thinking, but I'll bet you that we haven't seen the last of each other."

"Oh, I'll take that bet," Rollo said gleefully. Then he fluttered off to the wagon ahead. "Hey, let's go there, Mike," he called.

After a moment, Judith came back and climbed up beside her father. Michael started George up and pulled away from them, moving slowly.

Sam looked after them for a moment, and then flicked the lines to start his own team. "Well?" he asked.

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Judith smiled and said, "We'll see each other again."

The van entered its road and Michael swung it around so that it was broadside to Sam and Judith as they continued on ahead.

Sam stopped beside him and leaned over to shake hands. "Good-by, Mike," he said.

"Don't sound so final," Michael said. "Rollo and I'll be by. You can expect us."

Sam smiled at Rollo seated on his perch pole and said, "You know, Rollo, you're a notoriously poor judge of character."

Rollo said sourly, "Oh, if you're so good, where are all your feathers."

Sam chuckled and clucked to the team and the covered wagon pulled away, headed down the road, raising little whirls of dust behind it that hung and then drifted away. Michael waited a minute looking after, waved to Judith as she looked back, and then started George down the other road. END

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The Effectives

by ZENNA HENDERSON

They weren't supermen or psionic monsters — trouble was, they got some equally remarkable results!

ILLUSTRATED BY GIUNTA

Such things happen, inevitably, perhaps, since both seek isolation, but the sign post at the junction of the Transcontinental and the narrow secondary road seems a contradiction in terms:

AWAY . . . 8 miles
EDRU 14 . . . 12 miles

The association of these two groups is so unlikely that the picture of the sign post is always turning up in magazines, newspapers and TViews under Laugh-a-Bit or Smile-a-While or Whoda Thunkit?

Away—in the remote possibility that some one does not remember—is the name chosen by one of the fairly large groups of people who choose to remove themselves, if not from the present age, at least from the spirit of it. They locate in isolated areas, return to the agricultural period wherein horses were the motive power, live exclusively off the land, foreswear most modern improvements and, in effect, withdraw from the world. There are degrees of fervency ranging from wild-eyed, frantic-bearded, unwashed fanaticism, to an enviable, leisurely mode of living that many express longing for but could never stand. These settlements, and their people, are usually called Detaches.

EDRU 14, is of course, Exotic Diseases Research Unit No. 14. Each unit of EDRU concerns itself with one of the flood of new diseases that either freeload back to Earth from space exploration or spring up in mutated profusion after each new drug moves in on a known disease. Each unit embodies the very ultimate in scientific advancement in power, sources, equipment and know-how.

In this particular instance, the Power Beam from the Area Central crossed the small acres and wooded

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hills of Away to sting to light and life the carefully-fitted-into-its-environment Research Unit while the inhabitants of Away poured candles, cleaned lamp chimnies or, on some few special occasions, started the small Delco engine in the shed behind the Center Hall and had the flickering glow of electricity for an evening.

Despite the fact that EDRU 14 was only across a stone fence from Away, there was practically no overlapping or infringing on one another. Occasionally a resident of Away would rest on his hoe handle and idly watch an EDRU 14 vehicle pass on the narrow road. Or one of the EDRU 14 personnel would glimpse a long-skirted woman and a few scampering children harvesting heaven knows what vegetation from the small wooded ravines or the meadows on EDRU 14's side of the rock fence. But there was no casual, free communication between the so-unlike groups.

Except, of course, Ainsworthy.

He was the only one at EDRU 14 who fraternized with the residents of Away. His relaxant was, oddly enough, walking. He ranged the area between the two locales in his off-duty hours, becoming acquainted with many of the people who lived at Away. He played chess—soundly beaten most of the time—with Kemble, their Director—for so they call their head who is chosen by biennial elections. He learned to 'square dance', a romping folk-type dancing kept alive by groups such as the one at Away. Sometimes he brought back odd foods to the Unit that Kitchen refused to mess with. But, after a few abortive attempts to interest others at EDRU 14 in the group at Away, he gave up and continued his association with them without comment.

The disease, KVIN, on which EDRU 14 as well as EDRU 9, 11 and 12 was working, was a most stubborn one. Even now very little is known of it. It is believed to be an old Earth disease reactivated by some usually harmless space factor that triggers it and, at the same time, mutates it. Even those who have experienced it and—the few miracles—recovered from it, are no help in analyzing it or reducing it to A=the disease, B=the cure. A plus B=no further threat to mankind.

The only known way to circumvent the disease and prevent death is the complete replacement of all the blood in the patient's body by whole blood, not more than two hours from the donors.

This, of course, in the unlikely event that the patient doesn't die at the first impact of the disease. Most of them do. Even replacement would often fail. However, it succeeded often enough that each Regional hospital kept a list of available donors to be called upon. This, of course, was after the discovery of CF (Compatible Factor), the blood additive that makes typing of blood before a transfusion unnecessary.

In spite of all possible precautions practiced by the Unit, at unhappy intervals the mournful clack of the Healiocopter lifted eyes from the fields of Away to watch another limp, barely breathing, victim of the

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disease being lifted out to the Central Regional Hospital.

Such was the situation when Northen, the Compiler, arrived at EDRU 14—loudly.

A Compiler would have been called a *trouble-shooter* in the old days. He compiles statistics, asks impertinant questions, has no reverence for established methods, facts, habits or thoughts. He is never an expert in the field in which he compiles—and never compiles twice in succession in the same field. Very often a Compiler can come up with a suggestion or observation or neat table of facts that will throw new light on a problem and lead to a solution.

"I don't like questions!" he announced to Ainsworthy over the lunch table his first day at the Unit. "That's why I like this job of playing detective. I operate on the premise that if a valid question is asked there is an answer. If no answer is possible, the question has no validity!"

Ainsworthy blinked and managed a smile. "And who's to decide if an answer is possible or not?" he asked, wondering at such immaturity in a man of Northen's professional stature.

"I decide!" Northen's laughter boomed. "Simplifies things. No answer—forget it! But if I think there is an answer—tenacity's my middle name!"

"Then you obviously think there is a clear-cut answer to the question that brought you here," said Ainsworthy.

"Obviously." Northen pushed back from the table. "This is an inquiry into a *real* problem, not one of those airy nothings. And to forestall another obvious question I'm always being pestered with—I consider that I am only one biological incident in a long line of biological incidents and when I die, the incident of me is finished. I have no brief for all this research into nonsense about soul and spirit and other lives! One life is enough! I'm not greedy!" And his large laughter swung all faces toward him as he lumbered up to the coffee dispenser with his empty cup.

Ainsworthy reflectively tapped his own cup on the table top, repressing a sudden gush of dislike for Northen. It was thinking like his that was hampering the Beyond Research Units. How slow! How slow the progress toward answers to the unanswerables! Was it because Believers and Unbelievers alike were afraid of what the answers might be?

Northen was back.

"You were at the briefing this morning?" he asked as he sat down massively, his bulk shaking the table.

"Yes." Ainsworthy inspected his empty cup. "Something about the odd distribution of cures of KVIN, or, conversely, the deaths from KVIN."

"That's right," Northen inhaled noisily of his coffee. "As you know, a complete blood replacement is the only known cure. Only it doesn't work all the time. *Which* means—" he waggled a huge forefinger triumphantly—"that replacement is *not* the answer! At least not the whole

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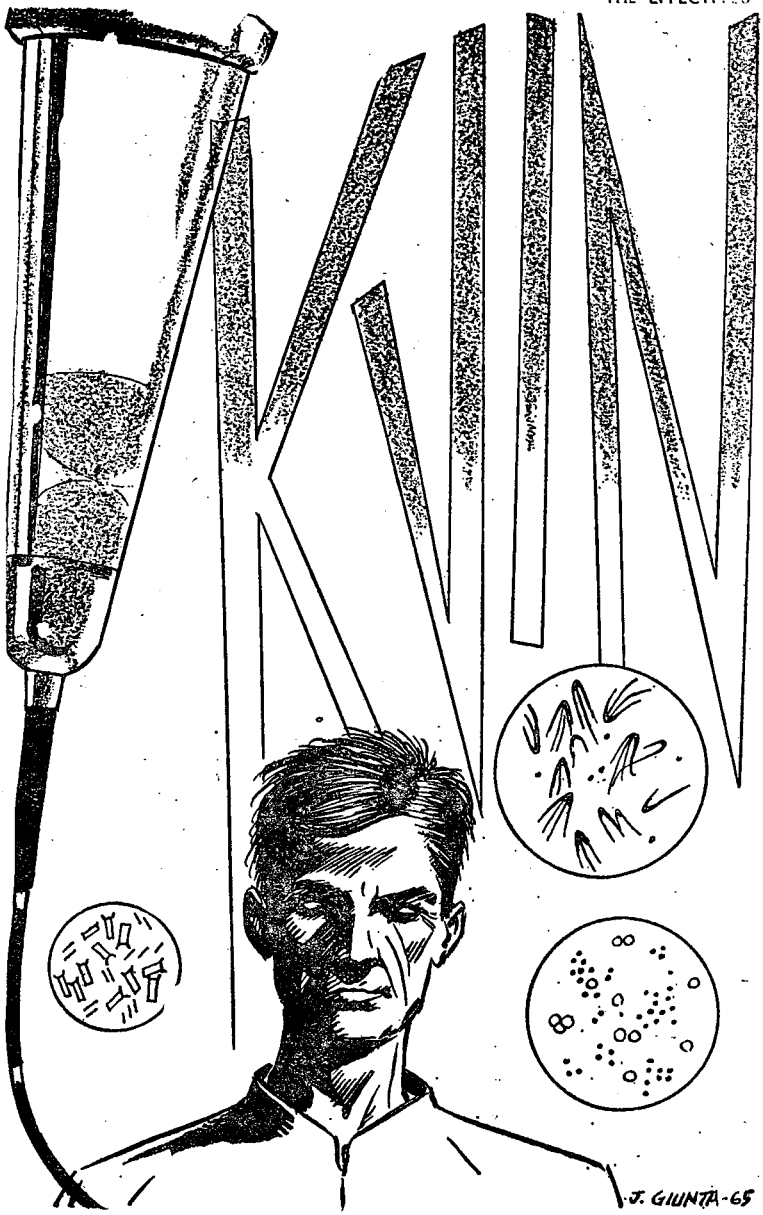

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answer. But that's not the question I'm currently pursuing. I want to know why there is a geographical distribution of the cures. KVIN is a fairly scarce disease. We've had less than 50 cases a year in the 15 years we have studied it—that is, the cases reported to and cared for at a Regional. There have been, undoubtedly, more unreported and untreated, because if a patient is out of reach of a Regional hospital and immediate treatment, he's dead in four hours or less. But we've had enough cases that a pattern is emerging." He hunched closer to the table and Ainsworthy rescued his cup and the sugar dispenser from tumbling to the floor.

"Look. A gets a dose of KVIN on the West Coast. Quick, quick! San Fran Regional! Replacement. Too bad. Dead as a mackerel. Now look. B and C gets doses at Albuquerque. Quick, quick! Denver Regional! Replacement. B lives—C dies. Personal idiocyncracies? Perhaps, except without exception *all* A's die. Half of B's and C's live!

"And D gets a dose at Creston. Quick, quick! Central Regional! D *always* recovers! Same technique. Same handling of blood. Same every thing except patients. So. Different strains of KVIN? After all, different space ports—different space sectors—different factors. So, E picks up a dose on the Coast. Quick, quick! *Central* Regional. Replacement. *Recovery!*"

Northen hunched forward again, crowding the table tight against Ainsworthy.

"So transport all the A's and B's and C's to Central? Not enough blood supply. Bring in more blood from other Regionals, *It won't work at Central any better than where it came from!* So—see? An answer to find, and definitely in this area. Now all I need is a case to follow through to get me started."

It had fallen to Ainsworthy to escort Northen about the Unit, to acquaint him with the area and answer any questions he might have concerning procedures and facilities. The two were in the small public lounge one afternoon, pausing between activities while Northen groaned over his aching feet and legs.

"I'm used to skidders," he boomed. "Faster, more efficient, less wearing on the legs! Just step on, toe the switch—swish!" He gestured with a massive arm.

"This Unit is really too small for skidders," said Ainsworthy, "Occasionally we use flitters out in the grounds, but only a few bother. Most of us enjoy walking. I do especially, since it's my relaxant."

"Really?" Northen peered in astonishment at Ainsworthy. "Imagine! Walking by choice!"

"What's your relaxant?" Ainsworthy asked, remembering his manners.

"Blowing up balloons," said Northen proudly. "Until they break! Bang! Wham!" His arms flailed again. "There's satisfaction for you! They're finished! Gone! Destroyed! Only a rag of rubber and a puff of carbon dioxide left! And I did it!"

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"Pleasant," murmured Ainsworthy, automatically falling into polite phraseology, wishing Northen's eyes would not follow so intently every face that passed, knowing he was waiting for someone to collapse from KVIN.

He wasn't long disappointed. As they toured Lab IIIC a few days later, one of the lab assistants, Kief, carefully replacing the beaker he had been displaying, took tight hold on the edge of the table, drew a deep quavering breath, whispered, "Away!" and collapsed as though every bone in his body had been dissolved, his still-open eyes conscious and frightened.

In the patterned flurry that followed, Northen was omnipresent, asking sharp questions, making brief notes, his rumpled hair fairly bristling with his intense interest and concentration.

The Healiocopter arrived and, receiving the patient, clacked away. Ainsworthy and Northen, in one of the Unit vehicles—a mutation of the jeep—swung out of the Unit parking lot and roared down the road to Central Regional, Northen struggling with the seat belt that cut a canyon across his bulk.

Northen peered at his notes as they bounced along. "How'd this Kief person know he had KVIN?" he asked.

"Don't know exactly," said Ainsworthy. "It varies from person to person. Clagget—the one before Kief, said a big brightness seemed to cut him in two right across the chest and then his legs fell off. Others feel all wadded up into a sticky black ball. Others feel as though each cell in their bodies is being picked away, as if from a bunch of grapes. I guess it depends a lot on the person's imagination and his facility with words."

"And what he said—'Away'—just before he collapsed. That was part of this picking-away idea?"

"No," Ainsworthy felt a surge of reluctance. "Away is the settlement next to our Unit—a Detach."

"A Detach!" Ainsworthy smiled slightly, his ears battening down hatches against Northen's expected roar. "Don't tell me you have any of those—" He bit off the last part of his sentence and almost the tip of his tongue as the jeep regrettably bucketed up over a hump in the road.

"The people from Away are our main source of donors for replacements," said Ainsworthy over Northen's muttered cures. "In fact, they've adopted it as a community project. Regional knows it never has to look farther than Away for an adequate number of donors—as long as the cases don't come too close together, which, so far, they never have."

They had arrived at the turn-off to Away and jolted off the fairly good Unit road to the well-maintained dirt road to the settlement.

"Surprises me that they'll give anything to the world. Thought they gave it up along with the Flesh and the Devil!" grunted Northen, lisping a little.

"Maybe the World, but not the people in it," said Ainsworthy. "The

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most generous people I know. Unselfish." He fell silent against Northen's barely contained disgust.

"Why'd we turn off here?" asked Northen. "Thought we were headed for Regional."

"No telephones," said Ainsworthy, swinging between the stone gateposts of the drive to the Center. "Have to alert them."

He was gratified that Northen fell immediately into the almost silent role of observer and kept his thoughts to himself.

Kemble met them at the door. "KVIN?" he asked, reading Ainsworthy's sober face.

"Yes," said Ainsworthy. "It's Kief. You probably heard the Healiocopter. Who's available?"

"Providentially, the workers are all in from the fields." Kemble stepped back inside the Center, and, tugging the bell rope that hung just inside the door, swung the bell into voice.

Ten minutes later he spoke from the Center porch to the crowd that had gathered from the stone and log houses that, with the Center, formed a hollow square of buildings backed by the neat home vegetable gardens, backed in their turn by woodlands and the scattered areas where each family grew its field and cash crops.

"KVIN," said Kemble. "Who's available?"

Quickly a sub-group formed, more than twice as many as were needed. The others scattered back to their individual pursuits. Kemble gathered the donors together briefly, speaking so quietly that Northen rumbled to Ainsworthy, "What's he saying? What's going on?"

"They always pray before any important project," said Ainsworthy neutrally.

"Pray!" Northen crumpled his notebook impatiently. "Wasting time. How are they going to get to Regional? One-hoss shay?"

"Relax!" snapped Ainsworthy, defensive of his friends. "These people have been personally involved in KVIN lots longer than you have. And they're going nowhere."

Kemble turned back to Ainsworthy and accepted calmly the introduction to Northen, reading his attitude in a glance and smiling faintly over it at Ainsworthy. He excused himself and called, "Justin, you're co-ordinator today."

Most of the interior of the Center was one huge room, since it served as meeting and activity center for the settlement. Under Justin's direction, closet doors were opened, cots were unfolded and arranged in neat rows down the hall. Equipment was set up, lines of donors were formed, and everything set in readiness by the time the Bloodmobile clacked out of the sky and pummeled the grass in the hollow square with the tumult of its rotors.

One by one the donors were given essential checks by means of a small meter applied to an ear lobe, and were accepted or rejected with quick efficiency.

Northen stood glowering at the scene of quiet activity. "Why can't they go to Regional like any other humans?"

"Any particular reason why they

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should?" asked Ainsworthy shortly. "They're a willing, never-failing source, and have been since our Unit was established. Why shouldn't we cater to them? It doesn't jeopardize any of our operations."

For a moment longer they watched the quiet rows of cots and their intent occupants, then Northen, with a grimace of annoyance, turned away. "Let's get to Regional," he said. "I want to follow this through, inch by inch."

"But there's got to be a difference!" Red-faced and roaring, Northen thumped on the desk in Isolation at Regional. "There's *got* to be! Why else do KVINs recover here?"

"You tell us." Dr. Manson moved back in distaste from Northen's thrust-out face. "That's your job. Find out why. We've researched this problem for fifteen years now. You tell *us* what we have overlooked or neglected. We will receive with utmost enthusiasm any suggestions you might have. According to exhaustive tests from every possible point of reference, there is no difference in the blood of these donors and any donors anywhere!"

He did a slight thumping of his own, his thin face flushed with anger, "And KVIN is KVIN, no matter where!"

"I don't like it," Northen growled a few days later. "Kief's convalescent now, but *why?* I've been drawing up another set of statistics and I don't like it."

"*Must* you like it?" asked Ainsworthy. "Is that requisite to valid results?"

"Of course not," growled Northen morosely.

"What statistics?" Ainsworthy asked, interest quickening. "A new lead?"

"It's true, isn't it, that the only blood donors used for KVIN replacements are those from Away?"

"Yes," nodded Ainsworthy.

"That's a factor that hasn't been considered before," said Northen. "I've queried the other Regionals—and I don't like it. There are no Detach donors involved at San Fran Regional. At Denver Regional, half their donors are Detaches." His thick hands crumpled the papers he held. "And curse and blast it! All the Central Regional donors are Detaches!"

Ainsworthy leaned back and laughed. "Exactly the ratio of deaths and recoveries regionally. But why are you so angry? Will it kill you if a Detach has something to do with solving our difficulty?"

"It's that those lumpheaded sons of bowlegged sea cooks at Central swear there's nothing in the blood of any of these Detaches that's any different from any other donors! And the benighted fuzzlebrains at Denver swear the same!"

"Hoh!" Ainsworthy leaned forward. "No answer?" he chuckled. "Maybe it's an invalid question. Maybe no one recovers from KVIN!"

"Don't be more of a fool than you have to," snapped Northen. Then automatically, "Your pardon."

"It's yours," Ainsworthy said.

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The two sat in silence for a moment then Northen pushed himself slowly to his feet. "Well, let's see this—who's he? The Away fellow."

"Kemble," said Ainsworthy.

"Yes, Kremble." Northen knocked his chair back from the table as he turned. "Maybe he can give us some sort of lead."

Kemble was in the fields when they arrived so they had a couple of hours to kill before he could talk with them. They spent the time in touring the settlement, each aspect of which only deepened Northen's dislike of the place. They ended up at the tiny school where girls, long-braided, full-skirted, and boys, barefooted for the warm day and long-trousered in the manner of Detaches, worked diligently and self-consciously under the visitors' eyes.

After they left the school, Northen snorted, "They're no angels! Did you see that little devil in the back seat slipping that frog down into the little girl's desk drawer?"

Ainsworthy laughed. "Yes," he said. "He was very adroit. But where did you get the idea that Detaches are supposed to be angels? They certainly never claim such distinction."

"Then why do they feel the world's so evil that they have to leave it?" snapped Northen.

"That's not the reason —"

Ainsworthy broke off, weary to the bone of this recurrent theme harped on by those who dislike the Detaches. Well, those who took refuge in such a reaction were only striking back at a group that, to them, dishonored their own way of life by the simple act of withdrawing from it.

Kemble met them in a small office of the Center, his hair still glistening from his after-work wash-up. He made them welcome and said, "How can I help you?"

Northen stated his problem succinctly, surprising Ainsworthy by his being able to divorce it from all emotional bias. "So it comes down to this," he finished. "Are you in possession of any facts, or, lacking facts, any theories, that might have a bearing on the problem?"

There was a brief silence, then Kemble spoke. "I'm surprised, frankly, at these statistics. It never occurred to me that we Detaches were involved in KVIN other than purely incidentally. As a matter of fact, we have no connection with the other Detach settlements. I mean, there's no organization of Detaches. Each settlement is entirely independent of any other, except, perhaps, in that a certain type of personality it attracted to this kind of life. We exchange news and views, but there are no closer ties."

"Then there wouldn't be any dietary rules or customs —"

"None," smiled Kemble. "We eat as God and our labors give us food."

"No halucinogens or ceremonial drugs?"

"None," said Kemble. "We approach God as simply as He approaches us."

Northen shifted uncomfortably. "You're Religious." He made it a placard for a people.

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"If the worship of God is so labeled," said Kemble. "But certainly, Detaches are not unique in that."

The three sat silent, listening to the distant shrieking laughter of the released school children.

"Then there's nothing, *nothing* that might make a difference?" sighed Northen heavily.

"I'm sorry," said Kemble. "Nothing."

"Wait," said Ainsworthy. "It's remote, but what about your prayer before various activities?"

"Prayer!" snorted Northen.

"But that's our custom before *any* —"

Kemble broke off. He looked from Northen to Ainsworthy and back to Northen. "There *is* one factor that hasn't been considered," he said soberly. Then he smiled faintly. "You, sir, had better assume your most unemotional detachment." Northen hunched forward, scrabbling in his bent and tattered notebook for an empty page.

"Go on," he said, his chewed pencil poised in readiness.

"I had forgotten it," said Kemble. "It has become so automatic. Each of us donors, as our blood is being taken, prays continuously for the recipient of that blood, with specific mention of his name and illness, if we know it. We try to keep our flow of intercessory prayer as continuous as the flow of blood into the containers."

Northen had stopped writing. His face reddened. His mouth opened. Ainsworthy could see the tensing of the muscles preparatory to a roar and spoke quickly. "Do you know if this is a practice among other Detaches?"

"We got the idea from a Denver Area settlement. We discussed it with them by correspondence and, if I'm not mistaken, we came to the same conclusion. It makes a purely impersonal thing into a vital personal service. They, as well as we, give intercessory prayer along with our blood." He stood up. "And that, Mr. Northen, is the only factor that I can think of that might make a difference. If you'll excuse me now, gentlemen, there are things to be done before milking time."

"One minute," Northen's voice was thick with control. "Can you give me a copy of the prayer?"

"I'm sorry," said Kemble. "There is no formal prayer. Each fashions his prayer according to his own orientation to God."

"Well, one thing." Northen sagged in exhaustion over his desk at the Unit. "This can be settled once and for all. The next case that comes up, we'll just make sure that no one prays anything while they're giving blood. That'll prove there's nothing to this silly idea!"

"Prove by a dead patient?" asked Ainsworthy. "Are you going to let someone die just to test this theory?"

"Surely *you* aren't feather-frittered mealy-brained enough —" roared Northen.

"What other anything have you found to account for the recovery of

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KVIN's at Central?" Ainsworthy was impatient. He left Northen muttering and roaring in a whisper over his notebook.

About a week later, Ainsworthy was roused out of a sound post-midnight sleep by the insistant burr of the intercom. He half fell out of bed and staggered blindly to answer it. "Yes," he croaked. "This is Ainsworthy."

"No prayer." The voice came in a broken rumble. "Not one word. Not one thought."

"Northen!" Ainsworthy snapped awake. "What is it? What's the matter?"

"I've got it," said Northen thickly.

"The answer?" asked Ainsworthy. "Couldn't you have waited until —"

"No, KVIN," Northen mumbled. "At least someone is sawing my ribs off one by one and hitting me over the head with them." His voice faded.

"Northen!" Ainsworthy grabbed for his robe as he called, "I'll be right there. Hang on!"

"No praying!" said Northen. "No praying. This'll prove it. No — promise — promise."

"Okay, okay!" said Ainsworthy. "Did you deliberately — " But there was no sound on the intercom. He stumbled out the door, abandoning the robe that wouldn't go on upside-down and wrong-side out, muttering to himself, "Not another case already! Not this soon!"

"He couldn't have deliberately infected himself," protested Dr. Given as they waited on the heliport atop the Unit for the Healiocopter. "In the first place, we're not even sure how the disease is transmitted. And besides, he was not permitted access to any lab unaccompanied at any time."

"But two cases so close together —" said Ainsworthy.

"Coincidence," said Dr. Given. "Or — " his face was bleak — "an outbreak. Or the characteristics of the disease are altering."

They both turned to the bundled up Northen as he stirred and muttered. "No praying," he insisted in a jerky whisper. "You promise. You promise!"

"But Northen," protested Ainsworthy, "what can you prove by dying?"

"No!" Northen struggled against the restraint litter. "You promised!"

"I don't know whether they'd —"

"You promised!"

"I promised." Ainsworthy gave in. "Heaven help you!"

"No praying!" Northen sagged into complete insensibility . . .

Later, Ainsworthy was standing with Kemble, looking around at the brisk preparations in the Center at Away. The Delco plant in the little back shed was chugging away and the electric lights were burning in the hall and floodlighting the area where the Bloodmobile would land.

"It'll be difficult," said Kemble. "We are so used to praying as donors that it'll be hard not to. And it seems foolhardy to take such chances. I'm not sure whether morally we have the right —"

"It's his express request," said Ainsworthy. "If he chooses to die to

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prove his point, I suppose it's his privilege. Besides, we really don't know if this is the key factor."

"That's true," Kemble agreed. "Very well, I'll tell the donors."

The waiting group looked back blankly at Kemble, after the announcement. Then a girl spoke.

"Not intercede? But we always—"

"I know, Cynthia," said Kemble. "But the patient specifically does not want intercession. We must respect his desires in this matter."

"But if he doesn't believe it'll do any good, why would it hurt him? I mean, our praying is our affair. His beliefs are his. The two —"

"Cynthia," said Kemble firmly. "He has been promised that there will be no intercessory prayer on his behalf. We owe him the courtesy of keeping the promise. I suggest to all of you that in place of interceding for the patient, you choose some other important need and intercede in its behalf. Or just blank your minds with trivialities. And Cynthia, you might use your time to assemble arguments pro and con on whether it is necessary for a person to know he is being prayed for, for prayer to be efficacious! I think Theo is going to give you a lot of trouble on that question as soon as we're through here!"

The group laughed and turned away, offering all sorts of approaches to both Theo and Cynthia as they drifted out to wait for the arrival of the Healiocopter. "It's hard to suspend a habit," said Kemble to Ainsworthy. "Especially one that is a verbal tie-in with a physical action."

When Northen finally came back to consciousness — for come back he did — his first audible word was, "Prayer?"

"No," said Ainsworthy, shakily relaxing for the first time since the long vigil had begun. "No praying."

"See! See!" hissed Northen weakly. "It wasn't that!"

"Take satisfaction from the fact, if you like," said Ainsworthy, conscious of a pang of disappointment. "But you still have no answer. That was the only new angle you had, too."

"But it wasn't that! It wasn't that!" And Northen closed weary eyes.

"Odd that it should matter so much to him," said Dr. Manson.

"He likes answers," said Ainsworthy. "Nice solid, complete answers, all ends tucked in, nothing left over. Prayer could never meet his specifications."

"And yet," said Dr. Manson as they left the room. "Have you read the lead article in this month's *Journal of Beyond Research?* Some very provocative —"

"Well, it's been interesting," said Ainsworthy as he helped a shrunken Northen load his bags into the jeep preparatory to leaving the Unit. "Too bad you didn't make more progress."

"I eliminated one factor," said Northen, hunching himself inside his sagging clothes. "That's progress.

"These clothes! Don't know whether to gain my weight back or buy new clothes. Go broke either way. Starved to death!"

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"But you haven't answered anything," said Ainsworthy. "You still have the unexplained geographical distribution *and* the presence of the Detaches in the case."

"Eliminate nonessentials. What's left will be essential *and* the answer," said Northen, climbing into the jeep.

"But what have you got left to eliminate?" asked Ainsworthy.

"Curse and blast it!" roared Northen. "Stop needling me! If I knew what to eliminate, I'd be eliminating it! I'm backing off to get a fresh start. I'll put these KVIN units out of business yet. And *you'll* be eliminated!" And, pleased with his turn of phrase, he chuckled all the way down the Unit drive to the road.

Ainsworthy felt a little disappointed and sad as the turn-off to Away swung into sight. He had an illogical feeling that, in some way, his friends had been betrayed or let down.

He braked the jeep suddenly, throwing Northen forward against the seat belt that no longer cut a gash in his bulk.

"What now?" Northen growled, groping for his briefcase that had shot off his lap.

"Someone flagging us down," said Ainsworthy, with a puzzled frown. "A Detach woman."

He pulled the jeep up into the widening of the Away road where it joined the Unit road.

The woman from Away stood quietly now by the clump of bushes that bordered the road, her skirts swept back a little by the small breeze that moved the leaves.

"Can we help you?" asked Ainsworthy.

"I — I must speak to you." The woman was examining her clasped hands. She looked up timidly. "If you'd like to come over in the shade." She gestured to a log under the overhang of a huge tree just off the road. Ainsworthy looked at Northen, Northen scowled and they both flipped open their seat belts and got out.

"I — I'm very interested in your research on KVIN," the woman said to Northen as the two gingerly found seats on the log. "Oh, I'm Elizabeth Fenway." Northen's eyes flicked with sudden intentness to her face. "Yes," she said softly. "You've heard of Charles Fenway. He was my husband. He preceeded you in your job. He died of KVIN at the San Fran Regional. I was there with him. We were both born and grew up here at Away, so I brought him back here and stayed."

Ainsworthy intercepted Northen's astonished look and smiled. "'Can any good come out of Nazareth?'" he quoted.

Northen reddened, shrugged inside his oversized clothes and fingered his notebook.

"When Charles was at San Fran Regional," Elizabeth went on, "just before he died, he had started checking out a new lead to KVIN that he had just turned up — the odd geographical distribution of deaths from KVIN."

Northen's eyes snapped to her face again.

"He was going over the list of donors, to see if the key could be there when he died, in spite of replacement." Elizabeth smoothed her

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hands down the sides of her skirts. "He hadn't even had time to write up the latest development. That's why you had to retrace his steps. I had an idea of what you were doing when we heard you were at the Unit." She looked sideways at Northen. "I wondered how you were going to react when you found your research lead you into such distasteful company. You see, your opinion of us at Away and of anything religion-oriented is well known at Away. That's why we complied without much protest with your wishes concerning our intercessory prayers.

"But I — " her voice failed her and she clasped her hands tightly. "I had gone on with Charles' statistical work, following the lead he had uncovered. I found the factor of the Detaches, too. You and your work have been in my prayers since you took over Charles' job."

Her voice failed her completely and she blinked and turned her face away. For an uncomfortable moment she struggled for composure. Then, in a sudden outrush of words, she said, "I couldn't let you die! The others couldn't have let you, either, if they had known! You can't just stand by and let another person die when you can save him! So I prayed! I interceded for you the whole time my blood was being drawn!

"I'm sorry! I'm sorry if I've done violence to your principles — or to your research. But I had to tell you. I prayed!" Then, with the barest sketch of the mannerly dip of the knees to the two men, she was gone, back through the woodlands to Away.

"Well!" Ainsworthy let out his astonished breath.

Northen was sitting, his face blank, his notebook crushed in one hand. Then slowly he straightened it out until he could open it. Laboriously he dampened the stubby point of his battered pencil in one corner of his mouth. Then he crossed out a few lines, heavily, and wrote, forming the words audibly as he recorded.

"One prayed. Was extra blood obtained as precaution? Was her's used in my replacement? Proportion of prayer necessary to be effective — *if* it is the effective factor."

He paused a moment, looking at Ainsworthy. "Is prayer subject to analysis?" Then he bent to his notes again. *"Is — prayer — subject —"*

END

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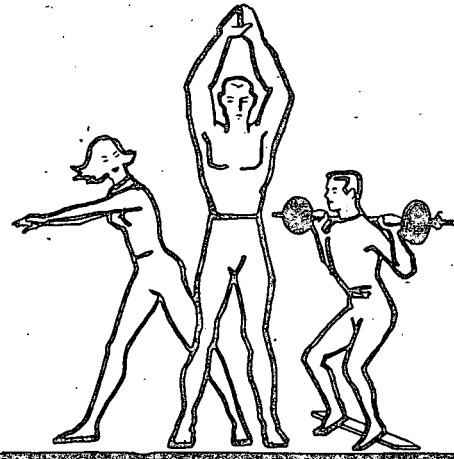

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THE ALIEN PSYCHE

by TOM PURDOM

Out there are worlds of aliens— winged, tentacled or whatever— and what will their minds be like?

In the good old days, in the Golden Age of Science Fiction, when a writer described an extra-terrestrial being he showed off his Imagination, and evoked the reader's Sense of Wonder by describing the extra-terrestrial's anatomy. Then somebody — Stanley Weinbaum, perhaps — ruined a good trade by making it hard work. In the aftermath of the Golden Age that you and I are now living in, when a science-fiction writer describes an extra-terrestrial's tentacles, or the seven fingers on his fourth hand, he is only beginning his labors. Nowadays the editors and the readers expect him to provide his creation with a detailed, consistent culture. And recently some writers have even been creating consistent alien psychologies.

Whatever is going to meet us out there, we are now beginning to realize, is not only not going to look like us — it probably isn't going to think like us or feel like us either.

Brian Aldiss's novel *The Dark Light-Years,* in which that inventive Englishman describes an alien race which treats defecation with all the ceremony and reverence humans treat eating and sex, is one of the best and most recent stories built around a psychological theme, but it is not the only one. As a reading of the Eighth Edition of Judith Merril's *SF: The Year's Best* will demonstrate. Psychology is fi-

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nally beginning to come into its own in science fiction.

After a long period of concentration on psionic mental powers which may or may not exist, science-fiction writers are beginning to pay attention to a phenomenon which definitely does exist, but which is a darker mystery and a greater wonder than reading minds or tossing furniture around with brain waves: the conscious and unconscious mental processes of the three billion human beings who inhabit the planet Earth, and the infinite multitudes of intelligent beings who inhabit the stars.

It is a little too soon to say psychology is the coming trend in science fiction, but if such a trend does develop it should be an exciting one. Psychology is loaded with problems and theories enterprising authors can turn into first rate story ideas. And the present state of psychology is such that science fiction has a good opportunity to perform one of its more valuable social functions.

Psychology needs uninhibited speculation of free swinging criticism almost as badly as alchemy and theology did in the era just before science started revolutionizing the world.

The common criticism of many physical scientists, that psychology really isn't a science, has more than a grain of truth in it. Although some complicated, impressive theories have been accepted by many people as gospel truth, almost everything one can say about the human mind is still debatable.

Imagine a science-fiction writer trying to create a believable extra-terrestrial. After mulling it over for awhile, he decides his imagination can use some help and he had better see what the current crop of psychologists can tell him. He is a talented, conscientious writer — a combination of Poul Anderson, Arthur C. Clarke, Robert Heinlein and Theodore Sturgeon — and he wants to base his work on sound information.

Lance has to determine Zorgnngl is intelligent, he thinks. How does he do it? How can I modify present day techniques so they can be used to measure an alien's intelligence? Can I extend our present definition of intelligence to include aliens? Zorgnngl should have a consistent psychology and alien behavior patterns. What is there in the human anatomy or the human environment which is so important that if I give Zorgnngl something different he won't think or feel like a human? If there's something about him which is similar to the human — sex, maybe, or he eats — does he have to feel the same way I do about it? Is there some psychological law I can't violate, the way you can't go faster than light? Does everybody who has a father have to have an Oedipus complex?

For all his talent and conscientiousness, the writer we are spying on seems to be a newcomer. As many readers of this magazine are probably aware, intelligence is something psychologists measure without being able to say what it is they're measuring. Intelligence tests

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have proved useful in assigning people to jobs, or in determining who should go to college when there isn't room enough for everybody, but psychologists have been unable to formulate a definition of intelligence. The old maxim that intelligence is what we measure by intelligence tests was the best definition possible when E.G. Boring proposed it in 1923, and it is the best definition available today.

There was a flurry of controversy five years ago when a schoolteacher demonstrated he could give children special training which would raise their scores on intelligence tests as much as thirty per cent. Actually, there was nothing particularly startling in this.

Alfred Binet, the French psychologist who invented intelligence testing in 1905, never claimed he was measuring a fixed, hereditary trait. A pragmatist, Binet was interested primarily in classifying students for educational purposes. The French school administrators wanted to set up schools for children who were extremely lacking in scholastic ability, and Binet devised the test which he found did the best job. Far from thinking he was measuring a fixed trait, Binet suggested drills by which a child with low intelligence might actually increase his abilities. He thought of a low intelligence as something to be treated, as one might treat a paralyzed leg.

The test he devised, however, was a departure from the thinking of the only other psychologists who were trying to measure psychological traits — the faculty psychologists, who measured individual "faculties" such as memory and reasoning ability. Binet tried to use faculty tests to select retarded children, but eventually found he got better results if he gave a test which sampled a number of abilities and gave each child a single over-all grade.

Did this mean that the individual faculties were simply a manifestation of one over-all faculty, the "intelligence", which Binet seemed to be measuring? The debate has raged ever since. A few years ago the pendulum even swung back to the faculty psychologists. Examining batteries of tests, some psychologists discovered that the scores individuals made on one area of the test often correlated with the scores they made on other areas. A person who did well on the section which tested imagination, for example, might inevitably do well on the section which tested attention and memory. Did this mean there was one underlying power which determined the scores for imagination, attention and memory, and perhaps another underlying power which determined the scores on other sections?

Instead of a single "intelligence", the brain's over-all ability might be made up of several factors, and if one could discover all the correlations on a battery of tests, one could locate and describe these factors.

The factor analysts set out to determine the number of factors, and to learn something about their nature. Eventually, they hoped, in-

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stead of giving someone a test for an undefinable intelligence, or for such surface characteristics as attention and memory, one would be able to give tests which were divided up in exactly the way the brain's powers are actually divided up.

Unfortunately, the attempt has not been very successful. The factors discovered on one group of tests rarely match the factors discovered on another group of tests. Something can be measured and given a name, but that doesn't mean it exists.

Sixty years after Binet, our hypothetical science-fiction writer still has a wide open opportunity for speculation. What will psychologists be measuring in the next century? Will they have succeeded in defining intelligence, and describing exactly how the intelligent brain works, or will they have given up the attempt?

If they have given up the attempt, then a space crew landing on a planet which may be inhabited by intelligent beings will probably be told to do what behavioral scientists do nowadays when they can't work out an adequate theory — they will be told to take a pragmatic view of the problem. Just as a psychologist devising an IQ test measures its worth by how well it selects students for certain types of training, so the explorers will probably apply tests which determine if the natives can relate to humans in any way the humans can consider meaningful. Can the aliens communicate with each other and is there any hope they can eventually communicate with us? Do they have ideas which we can understand and which can be of value to us? Do they have the most practical and useful trait of intelligence any race can have when visited by Earthmen — can they match any weapons we can use against them?

Unfortunately, such tests do not help us resolve the moral issue. How do we keep from killing and enslaving beings who are our intellectual equals, but whose intelligence may manifest itself in behavior we cannot possibly recognize as intelligent? Some of the most poignant and interesting stories ever written have dealt with this problem, and some ingenious solutions have been proposed. For every definition of intelligence ever suggested, however, any writer worth a page in a science-fiction magazine can usually dream up at least one believable exception. We may pragmatically assume that all beings who build fires, use tools, have a religion, or speak a language, are to be considered intelligent and treated as our equals, but sooner or later we are bound to run into beings who do nothing on our list, but who manifest their intelligence in ways no human being could possibly imagine.

Judging by the current state of psychology, the problems created by this situation are inherently insoluble. If we cannot satisfactorily define intelligence for our own species — if we cannot demonstrate we ourselves are intelligent — how can we hope to detect intelligence in other species?

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One way out of this is to concentrate on physiological traits. Brain size is sometimes suggested, but as has been pointed out many times, it is not conclusive. The elephant has a bigger brain than man, but does nothing humans think of as intelligent. The complexity of the brain is apparently more important than its size.

To be on the safe side, we could assume any animal with a brain as large as ours is intelligent, but this would not help us if we ran into a being as intelligent as man but with a brain the size of the hummingbird. And it would not help us if we ran into a being with nothing we could recognize as a brain.

On the other hand, suppose that sometimes in the next century we are able to locate all the physiological factors which make intelligent behavior possible. Suppose a doctor is able to say with confidence that if we make *this* minute change in body chemistry, or *that* minor change in the structure of the brain, then we can raise the patient's score on IQ tests by so many points, and give him the ability to succeed in any occupation he chooses. Suppose our understanding of the physical basis of the brain's powers is so complete that people correct their IQ's with drugs or electrical devices as casually as they now correct their eye sight with glasses and contact lenses.

Having gone that far, suppose something which may seem far more improbable, but which is even pleasanter to imagine. Suppose the human race has become so morally sensitive, so horrified at the thought of harming another intelligent being, that it is willing to spend vast sums of money applying its psychological knowledge to the moral problem created by interstellar exploration. Even if intelligent behavior may be something we cannot recognize, our descendants reason, we can still determine if the brain which chose that behavior is at least as good as ours.

In a special Office of Non-Human Psychology, scientists attempt to work out every possible combination of physical traits which could result in intelligent behavior. If this chemical is eliminated from the body, they calculate, then it must be replaced by the following, in the stated qualities . . . If the brain is one tenth the volume of the human brain, then the speed with which impulses move along the nervous system must be . . . If the being has no body, then . . . Starting with minor changes in the human body, they create models of more and more alien beings.

Their models would not be a conclusive test of intelligence, but they would be one more test an explorer could apply when all other tests had failed. Landing on Planet X and observing no sign of intelligent life, no fires, no wars, no machines, he runs some basic physiological tests on any animal he feels like eating.

Collect blood samples, his instruction book reads, and urine and waste samples, if any, and insert in analyzer. Insert pink and blue electrodes in skull and at points on ex-

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tremities or other parts of the body which seem appropriate . . . Check results against charts on page 20 to 43 of this manual. If curves fall into red areas on charts, YOU HAVE ENCOUNTERED AN INTELLIGENT BEING. DO NOT HARM. TREAT WITH RESPECT. REMEMBER — THE FATE OF THE HUMAN RACE COULD BE DECIDED BY YOUR ACTIONS.

Such problems, hopefully, will be rare. Rather than get bogged down in a theme which has been handled superbly by some of the best writers in the field, our author decides to have Zorgnngl meet his space explorer with an overwhelming and unmistakable evidence of intelligence — a laser beam which misses his face by half an inch. Since the alien has come on stage performing a common, human type act, the author immediately begins to search for ways in which his creation can be more alien than anything Brian Aldiss ever imagined.

Hopefully he turns to Freudian psychology, the best known of all the theoretical models of the human psyche. What is there in this detailed diagram of the mind which can be altered in some believable and interesting way?

The stages of infant sexual development look promising. According to Freud, what happens to individuals during certain crises in infancy determines many character traits in later adult life. Events which may look trivial to the adult — who has, of course, repressed his own memories of that horrible period — are actually traumatic, personality shaping events for the infant.

In the drama of human infancy, as scripted by Freud, there are three stages. First the oral stage: the infant, helpless in his crib, receives all his pleasure and gratification through his mouth. Then the anal stage: the human infant is taught to control his bowel movements. And finally, the phallic, or oedipal stage: the young male discovers his sex organs and goes through a period of mingled anxiety and pride. Each of these stages has its problems and pleasures, and if the he fails to resolve the conflicts of any stage, the Terran may spend the rest of his life trying to resolve them in various symbolic ways.

An individual may also regress, under pressure, to a stage which he found particularly pleasant. The oral stage, for example, is often considered responsible for the widespread habit of sucking on cigarettes. Sucking is one of the first actions by which a human gives himself pleasure, and relieves an unbearable tension, and thus for many humans sucking is soothing and gratifying throughout their lifespan.

Consider a being who lives in the thick atmosphere of a planet like Jupiter, and who is entirely surrounded by nutrients which he absorbs through his skin. The children of such a race would not normally experience periodic hunger during the first months of their life. Like plants, or the whales, who feed on plankton, they would normally feed continuously and painlessly throughout the day. Unless some catastrophe

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affected their food supply, they would never feel a hunger pang.

More than smoking or some other trivial habit might be affected by this. A Philadelphia psychoanalyst, a strict Freudian (and no coward), once gave a talk before the Philadelphia Science Fiction Society in which he argued that science-fiction stories are a perfect symbolic analog of the oral stage, and therefore reading science fiction must be considered an attempt to re-experience this stage.

The infant, he said, lives in a mysterious world in which he is (1) beset by massive internal and external forces he does not understand, (2) surrounded by people who are indistinguishable from each other, and (3) has his needs satisfied when he screams. Similarly, the science-fiction hero is (1) beset by awesome social and historical forces, (2) surrounded by one dimensional characters, and (3) solves his problems by an act of magic which is similar to the elemental scream of the infant — he uses a newly invented super weapon which is usually little more than a mere verbal formula. In addition, in science fiction the hero is usually aided by a kindly older man, the scientist who invents the super-hypergamma ray, and in infancy the baby is aided by a kindly older man, the father who heats the bottle at two in the morning.

Will there be a *Worlds of Tomorrow* on Jupiter? If not, what will there be?

Future students of galactic psychology may speak not of an oral stage, but of a "nutrient-ingesting" stages, and may feel the important aspects of the Jovian nutrient-ingesting stage are that (1) the Jovian is not dependent on other members of his species and (2) there is complete, continuous satisfaction. Since this would be a period in the Jovian's life in which he experienced no tension whatsoever, he would probably enjoy regressing to it. He would not be soothed, however, by the human narrative pattern of increasing tension culminating in a happy ending. Monotony would be his pleasure. He would probably surround himself with music, or perhaps patterns of color, which went on and on with only minor changes.

In the Jovian mind infancy would be associated with independence, not dependence. If Jovians placed as much value on "growing up" as humans do, the fully independent individual might be held in contempt and considered childlike, and dependence might be highly esteemed. Just as humans have to convince themselves that smoking is an act which signifies maturity, Jovians would have to disguise their retreat into infantile independence by telling themselves they wanted to be alone to think about philosophy or to contemplate a work of art.

The human anal stage shapes patterns of behavior which are more obvious than the patterns shaped by the oral stage. It is usually less pleasant, too. Learning to control any physical process is difficult, and it is particularly painful when you are very young, the process is very

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basic, and you are learning to control it only because of the mysterious, irrational demands of a parent.

If the parent is too obviously disgusted with the products of the child's bowel movements, the child may grow up feeling that everything that comes out of him, including his words and his thoughts, is disgusting and evil. Or he may be extremely neat and fussy, and anxious to get things straight, because his parents were too strict.

One school will even tell you the artist manipulates paint because he is gratifying a frustrated desire to play with his feces. Conversely, the artist can also be someone who was toilet trained by a parent who encouraged him with gentle words, and praised him when he produced, and who is therefore emotionally committed to the idea that whatever comes out of him is good, and that he can win approval by excreting new ideas and new works. Or a man may enjoy producing works which many people find disgusting and unpleasant because he hates his parents for what they did to him during this stage, and disgusting and upsetting people gives him pleasure.

If our hypothetical Jovians had to control their excretions — so as not to ruin their food supply, perhaps, or in order to keep themselves free of germs and parasites — their first relationship with other members of their own species would be disciplining and authoritarian. The parent would have to make demands on the infant, and force it to control its behavior, without first having been the source of a basic gratification.

Jovians might never develop tender feelings for their parents, and therefore might never develop tender feelings for members of their own race. Jovian personal relationships would probably be characterized primarily by dominance, submission and rebellion.

Jupiter might be the most tragic planet in the solar system, a world on which the inhabitants were doomed to endless warfare as authoritarian militaristic cultures fought for supremacy.

But suppose a being did not eliminate waste products? Evolution might produce an intelligent race endowed with a digestive system which could turn everything they ate into fuel or body matter. They might have to be creatures who kept on growing until they died from obesity, but even that isn't impossible. Natural selection is supposed to select those who are "fit", but the fit are simply the individuals who can survive until they're old enough to reproduce.

Natural selection will not eliminate a gene from a race's chromosones unless the gene makes it less probable an individual will reach the age of reproduction — and there is no reason why a gene for unlimited growth should have such an effect. The woolly mammoth, for example, had horns which were effective weapons when he was young and fighting for mates, but which kept on growing and eventually got so long they were often useless and even harmful in his old age.

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Even if a being did eliminate waste, he might expel nothing more troublesome than the carbon dioxide all Earthly mammals expel after every breathe. Waste products do not have to be liquids and solids. Intelligent extra-terrestrials could evolve in an environment in which some factor such as an extreme of temperature or the need for concealment made it impossible for them to eliminate anything but colorless gases. They could eliminate as unconsciously as humans breathe, and thus, like our hypothetical being who doesn't eliminate at all, could grow to maturity without being forced to learn how to control the process.

Toilet training is absolutely necessary for sanitary reasons if humans are to live in cities and create a technological civilization, but our descendants may encounter technologically advanced races which have grown up without this early trauma.

Or will they? Toilet training impresses the virtues of neatness and orderliness on the human being at an age when the psyche is so impressionable the training creates deep-rooted compulsions. Western man might not have his urge to create an orderly, scientific view of the universe if Western culture did not decree that every infant must get a basic physiological process under control before he is four years old. If an entire race grew to maturity without this early and intense educational experience, they might not produce a single theoretical scientist.

Of course if they were still curious about their environment, they might create a different, sloppier kind of science than the one we humans have created. Our emphasis on mathematics and precision would not dominate their investigations. Our science began with the Greek culture, which invented geometry and scorned the experimenter who actually cut up animals, but their science might begin with a culture which neglected mathematics completely, and concentrated on anatomy and natural history. Their bridges might be crude but serviceable, but their medicine might be the wonder of the galaxy.

Their sociology and psychology might excel ours, also. If precision is impossible in the social sciences — and it may be — then a compulsion to be precise may be more of a hinderance than a virtue. Unlike human psychologists and sociologists, they would not feel they should study only those aspects of reality which can be measured, and they would not think precise measurements of the behavior of rats were preferable to imprecise observations about the behavior of intelligent beings.

On the other hand, some human scientific discoveries might completely escape them. No Copernicus would be nagged because a system of astronomy which put the Earth in the center of the solar system resulted in minor errors in the positions of the planets. And if Johannes Kepler demonstrated that the orbits of the planets were not circles, but ellipses which were *not quite* circles, who would care?

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Art would have looser forms, too. The Greek tragedy, with its simple plot and dramatic unities, might not seem so impressive to a race without an anal stage. And they might find it hard to understand our enjoyment of the simple, pure forms of classic Greek and modern Western architecture.

Elimination is important, but it is not the most basic of the biological processes. Far more varied and dramatic opportunities for speculation confront our author when he studies Freud's phallic stage. For here he is considering a compulsion which dominates every aspect of human life — the urge to reproduce. And when our ships begin exploring the mysteries of the stars, we may discover there is no limit to the number of ways intelligent beings can reproduce.

Imagine . . .

Intelligent beings who reproduce by fission.

In order to enjoy the benefits of social organization, they do what humans have done and slowly introduce some kind of order into their reproductive habits. They only fission when the young have been provided for, and other social obligations have been fulfilled. Like humans, they enforce their sexual regulations primarily by internal repressions, rather than by external force. And all through their history, they are plagued by rebellions and civil wars led by over-repressed beings who want to split society because they cannot split themselves.

Imagine . . .

Intelligent beings who reproduce as some Terrestrial fish do: the fertilizing-sex fertilizes the egg after it is outside the egglaying sex's body.

In Freudian theory, the phallic stage is the period in which the young human discovers the sexes have different genitalia. The boy discovers he has a penis and the girl doesn't, and he becomes proud of his "superior" organ and, simultaneously, afraid he may lose it (as the girl apparently has). The girl, on the other hand, becomes envious and fears there is something wrong with her. And at this time also, the boy represses that famous desire to eliminate his father, and win the affections of his mother, which Freud considered a universal emotion, and a major event in the development of the human psyche.

If the female (egglaying) sex, then left the scene after the eggs were laid, and left the protection and training of the young to the male (fertilizing) sex, the discovery the sexes have different reproductive organs would be even more traumatic for the children of this species than it is for humans.

The experience would be all the more intense if the differences between the sexes were extremely gross. The females might be small creatures who survived attack by running away, and the males might be large, fanged, armored characters who could stand their ground and protect their offspring.

To the children, the young female might appear not only castrated, but also deformed, stunted, and without any observable future as a grownup.

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(Stories in which some despised Cinderella type achieves a glorious destiny might be very popular among the adult females.)

Human psychiatrists have blamed certain personality disorders on jesting — and not so jesting — parents who tell their sons they will be castrated as a punishment. Think what an angry "I'll kill you!" would mean in the situation we are considering. To the children, an early death might seem the literal fate of all the girls in the family.

The threat to kill the young male would not be an uncommon one, either, at least not in primitive times. Instinct might make the father look after the very young, but once his children grew older other instincts would dominate his behavior. The primitive father would not give his children a little lecture on the facts of life. He would keep them in complete ignorance, an easy thing to do when the other sex isn't around to oppose you, and he would subjugate (or kill) his sons, and gratify his lust with the mysterious objects secreted by his daughters. What else are children for?

The crime which arouses the most horror is, of course, the crime you yourself are most tempted to commit. As this race became more civilized, and established rules against incest, some poet in an early civilization would eventually make a great tragedy out of a legend which seemed to have an uncanny power over audiences.

There was a city ravaged by the plague, the legend would go, and the king of the city learned that the gods had sent the plague because someone in the city had committed a terrible crime. To save his people, the king set out to uncover the criminal and punish him. And in the end, after following each clue the gods had put in his path, for it was all a trap the gods had set to destroy him, the king discovered that the criminal was himself. He had fulfilled a prophecy which had been made at his birth, and which he had often mocked during his life. He had killed his own sons, and fertilized the eggs of his daughters.

There would probably be a variation in which the sons killed the father, and fertilized the eggs of their sisters, but there would be no legend in which the sons fertilized the eggs of their mother. Motherhood would probably be important primarily in religion. The absent parent is easy to idealize. Religious types would undoubtedly see God as a distant, remote creature who lived in a beautiful, self-contained paradise — and who will someday descend on this world and give its rulers exactly what they deserve.

Temperament would be drastically affected by the impersonal nature of sex relations. The sexes would probably never develop tender feelings toward each other. Their sexual desires would not be emotion which could develop into affection. The females would achieve sexual satisfaction all by themselves, and for the males the sexual object would not be another being but an inanimate thing.

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Indeed, with impersonal sex relations and the kind of oedipal stage we have postulated, the normal individual in this species might be the kind of person human psychiatrists classify as a psychopathic personality. He might be an individual with no conscience and with no empathy for the feelings of others, a being who ruthlessly and coldbloodedly eliminates anyone who gets in his way. Science-fiction writers have often described such completely nasty characters so they can have a good villain for a space war or an invasion of Earth story. When we actually explore the galaxy, we may discover that an entire race without a single redeeming virtue is not as unlikely as it may have seemed.

Imagine . . .

A race with only one sex, true hermaphrodites who reproduce by mutual fertilization.

This race would need two Oedipus tragedies. In one play the hero would slaughter both his parents, and in the other play he would make love to both of them. Children might prefer one parent to another, but normally the preference would change from time to time throughout childhood, and hate and love could not be linked to sexual differences. Individuals who were dominated by one of their parents might have an easier life as adults than humans do when fate gives them this particular handicap. Humans with oedipal problems generally have trouble with their relationships with all men or all women, but hermaphrodites would transfer their oedipal emotions only to people who resembled their parents in subtler ways. They might have trouble dealing with blue-eyed blondes with green tentacles, but they wouldn't have troubles with every male boss, or every girl they might want to marry.

On the other hand, hermaphrodites might have more trouble than humans with neuroses caused by sexual repression. Humans control the sexual drive of their children partly by segregating the sexes, but for a species with only one sex this would obviously be impossible. One could not send a group of young men off on a camping expedition and be certain none of them will come home pregnant. Strict rules of conduct, stern parental commands, taboos, chaperones, and other instruments of repression would pervade every aspect of an adolescent's life. And the stronger the repressions imposed during youth, the harder it is to be uninhibited and free of guilt during maturity. Hermaphrodite races might be the biggest prudes in the galaxy.

Of course, if the task were too difficult, they could simply give it up and develop customs which made sexual control unnecessary. They might encourage extremely early marriages, or tradition could decree that children were to be reared by the parents of whatever youngster bore them.

If they did try to control their sex drive, some individuals might reach maturity with one aspect of their sex life so inhibited they were functionally mono-sexual. In

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civilized societies, their ailment would eventually be treated as a sickness and either cured or tolerated, but in primitive and barbaric societies mono-sexuals would either be feared, or treated with contempt and derision.

The existence of such mono-sexuals would create other psychological problems. Nature never does anything perfectly; every member of this species would undoubtedly be a little more "male" than "female", or vice versa. Most normal individuals would therefore feel some doubt and anxiety about their sexual wholeness. Just as many human males have to show how masculine they are, many hermaphrodites would have to show the world they were the most potent, fertile, complete bisexuals anybody ever saw.

In most human literature, the narrative interest is created by a struggle between two individuals or two groups. In hermaphrodite narratives, this might be a very uncommon plot. The human infant soon notices there are two kinds of people in the world — and most parents tell him, in many little ways, how important it is that he know which kind he is — and this may be the reason humans have a tendency to see a world classified into two's. To humans, there are Good and Evil, God and the Devil, and only Two Sides to Every Question. The Chinese concept of Yang and Yin — Active and Passive, Creative and Destructive, Male and Female — is a famous and revealing example of this eternal human tendency.

Instead of stories in which two forces struggle for mastery, hermaphrodites might prefer stories in which the hero fights inanimate nature, or grows in wisdom and virtue. They might not have any pulp magazines featuring *How I defeated the Nazis with My Bare Hands*, but they might relish the equivalent of *How I Climbed Mount Everest*, or *The Story of My Psychoanalysis*. And they might never produce a philosopher such as Karl Marx, with his famous theory that history is dominated by the struggle between a Thesis and an Antithesis which must always fuse in a new Synthesis.

Image . . .

A galaxy one hundred thousand light years in diameter!

One hundred billion stars!

Millions of self conscious, culture building, tool using life forms!

Some readers may have difficulty imagining a world on which intelligent beings have only one sex, or fission as if they were still one-celled animals. Both these reproductive methods have drawbacks which would probably eliminate them from the evolutionary process long before any species could evolve something as esoteric as a powerful brain.

However, we do not know what kind of planetary environments can produce intelligent life — and despite all our theorizing we will not know until we begin exploring the planets of our galaxy. Only a few years ago most scientists who talked about life on other worlds insisted life could only evolve on worlds roughly similar to Earth, and be-

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lieved it was a rare accident in a universe in which most suns existed without planets.

Today an astronomer such as Harlow Shapely can tell his readers there must be thousands of life bearing planets in our galaxy, and a man as learned in biochemistry as science fiction's own Isaac Asimov can describe ways in which life could occur on Jupiter. When we think about life on other worlds, we should assume anything is possible, including a quirk of the environment which could make fission or egglaying as efficient as the sex practices we are used to here on Earth.

But if we don't have to limit our speculations about physiology, is there any reason why we should limit our speculations about psychology? Why assume the galaxy will be inhabited by beings who obey the laws dreamed up fifty years ago by Sigmund Freud? Do we even have to assume that the behavior of all intelligent beings will be dominated by the frustrations and pleasures experienced in the early years of life?

The answer, of course, is that at this moment in the history of psychology we do not have to assume anything at all. Psychological theories can give us some interesting hints on which to base our speculations, but there is no reason why any science-fiction writer should feel limited by them. As our young writer will soon learn if he continues his reading in this turbulent science, there are many psychologies other than Freud's. The Adlerians, the Jungians, the Rankians, the neo-Freudians, Sullivan's inter-personal school, all make up a varied and competitive tribe. All can point to evidence which supports their theories, including successful therapy, and all can present evidence which cannot quite be fitted into the theories of the other schools.

Psychology is now about a century old, but it is a century old infant. There is enough healthy dispute going on to please anyone who thinks mysteries are more exciting than facts, and controversy more interesting than agreement.

There are many reasons why psychology is still in such a primitive stage, but perhaps the most important is that all attempts to explain human behavior eventually run into an insurmountable obstacle — it is impossible to set up experiments which will adequately test the theory. The theorist can say "Delos D. Harriman wants to go to the Moon because . . ." but he cannot say, "If you rear X number of children as Delos was reared, and X number of children in a different manner, and put both groups in rigidly controlled, identical environments, arranging things so that only the significant variables are different, then all the children in the first group will want to go to the Moon . . ." That might be a valid experiment, but who would let him do it?

Of course, the theorist can say that children raised by loving parents will have certain character

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traits, and he can gather evidence that children who have been raised by unloving parents do not have these traits. There are so many random factors in every child's upbringing, however, that even a high statistical correlation between, say, slums and crime, will not prove slums make criminals. It may provide enough evidence to quite rightly convince any humane, decent person that slums should be eliminated, but it will not provide enough evidence to satisfy the rigid standards of science.

Sometime in the next century, however, psychologists should be given a new opportunity to test whatever theories they may be debating at that time. Again, it will not be a test which meets the most exacting requirements of science, but it will be one more check on a body of theory which needs all the checks it can get.

Whatever psychological theory he upholds, a theoretical psychologist should be able to deduce the consequences, if his theory is true, of a being having a body which differs in some crucial way from the human body. He should be able to work out ways in which this crucial difference would affect the being's art and social organization, and even his technology. In short, he should be able to do, but with more precision and sophistication, what we have been trying to do in this article.

And when interstellar explorers establish contact with other races, they can see how well the predictions of the theorists match the reality of the cosmos.

Interstellar exploration will present us with more psychological data than any event in human history. Every planet inhabited by intelligent beings will be a laboratory in which we can observe the results of experiments in which personalities will have been shaped by every possible variable. People with an intense interest in psychology are often fond of saying we should study ourselves before we go racing off to the stars, but when we begin collecting data about the cultures of the Milky Way, we will probably learn more about ourselves in a few years than we could have learned in centuries on Earth.

And in the meantime — we can have fun speculating about what we'll learn. END

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BOND OF BROTHERS

by MICHAEL KURLAND

Illustrated by MORROW

It was the most supersecret research spot in Russia. All he had to do was march right in and steal a prisoner!

I

The tall man entered the Denver office building. With the air of a man who knows exactly what he's doing, he walked down the long bank of elevators and went in to the last one on the left. After the door had closed, he pressed the button marked *five* and the button marked *ALARM* simultaneously. The elevator churgged to itself, and then took him straight down some three hundred feet.

The door opened, and the man stepped out of the elevator. Facing

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him, blocking the corridor from floor to ceiling, was a heavy steel fence. A young MP sat at a desk on the other side of the barrier.

"Yes, sir? Your badge please?" The MP said. The elevator door slid quietly closed.

"I don't carry a badge," the tall man said. "Tell Colonel Culverson that Andreas is here to see him."

The MP spoke briefly into a hush-phone on his desk, and a television camera blinked on for a few seconds and surveyed the tall man.

"Colonel Culverson says to have you escorted to his office," the MP said finally, "make no attempt to go anywhere else." He pressed a button on his desk and studied a dial for a few seconds. "You're not armed," he stated.

A door in the fence clicked opened, and a second MP stood inside. "Please come this way, sir," the second MP said. Andreas walked past him, and the MP carefully closed the door. "Please walk in front of me down the hall," he said.

Without further prompting, the man called Andreas walked ahead of the MP down the corridor, turned left at the second intersection, and came to a stop in front of the fourth unmarked door down the hall. The MP knocked for him.

"Come in."

The MP opened the door and stood aside. Andreas entered and walked over to the desk as the MP closed the door behind him.

The man behind the desk, a lean, hard-looking man in the uniform of a United States Army colonel, stood up and extended his hand.

"Jimmy! It's good to see you. We didn't expect you for several weeks yet. How did the job go, and why didn't you report in to our Berlin office before you came back to the States?"

The tall man stopped in front of Colonel Culverson's desk and stared at him with a curious expression on his face.

"I am not James Andreas."

The colonel stared. "A beautiful job," he said. "Who are you, and what do you want? You realize that if you try anything you won't leave here alive."

The tall man relaxed and chuckled. "Perhaps I was overdramatic," he said. "This was not a 'job', I was born with these rather undistinguished features. James Andreas is my twin brother."

The colonel slowly sat down. "You must be Thomas then," he said. "You're a — professor — in some midwestern college."

The tall man nodded. "Right," he said. "Lamont College in Ohio. Professor of Modern Languages."

Colonel Culverson pressed a button on his desk. "Professor Andreas," he said, "I have several questions for you; how you found out about this place, and what you're doing here are two of the more obvious ones. But before I ask you anything, I'll have to verify your identity."

"Of course," Andreas said.

A sergeant came in, and, at instructions from the colonel, efficiently took Andreas' fingerprints and then left with the card.

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The two men sat in silence while waiting for the report. The colonel tried to busy himself with routine paperwork, while Tom Andreas just stared around the office. It looked so familiar, this place where each one of his brother's missions had originated. Seeing it through his own eyes instead of his brother's caused different things to be emphasized. His brother had found it a relaxing place, this square gray cubicle; to him it represented order and efficiency. Tom found that it made him nervous; the file cabinets, the metal desk with its inlay of push-buttons, the gray sameness of everything made him think of a prison. This was one chain of thought he could well do without right now. He found himself staring at a framed seascape that hung on one of the otherwise bare walls.

"You like the painting?" The colonel interrupted his thoughts. Tom nodded. "Your brother can't stand it, he says it makes him seasick." The colonel smiled, "My wife got it for me, she came here to visit me once and said the place looked too bare."

"I agree with your wife."

A buzzer sounded from the colonel's desk, and he selected a button to push. "Yes?"

"Prints check out, sir," the disembodied voice said. "Professor Thomas Andreas of Lamont College. Positive identification."

"Thank you, Sergeant. That will be all." The colonel released the button and leaned back in his chair. "So much for that," he said to Andreas, "now . . ."

Andreas sat forward. "I'm not sure how I'm going to explain this," he said, "so let me get to the essential part first."

The colonel nodded. "Please do," he said.

"You sent my brother on a mission to Tradesgodork in Russia, right?"

The colonel jerked himself upright. "How the devil did . . ."

"My brother has been captured. He's in prison." Andreas leaned back in his chair and appeared to slump down. "That's the important part. Now ask your questions."

The colonel thought for a minute without saying anything. "Would you like some coffee?" he asked finally.

Andreas nodded.

Colonel Culverson flipped the intercom switch. "C and D, Charlie — for two." He released the switch and swiveled to face Andreas. "I had assumed," he said, "that your brother talked too much. That, despite the strict regulations against it, he had told you what his job was and how it worked. Now that assumption isn't tenable. I *know* that your brother didn't know what his last assignment was until he reported here. And I also know that, after being briefed, he went directly to the airport without communicating with anyone." The colonel paused for a second and regarded the top of his desk as if it were completely unfamiliar to him. "And if," he continued, "he has been picked up — as you say — then you have information we don't. Information he couldn't possibly have got-

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ten to you." The colonel glared at Andreas. "I haven't the slightest idea of what to ask," he finished. "You'd better explain in your own way. And it had better good!"

Just then the conversation broke off, while a sergeant brought in a tray holding two cups of coffee and several doughnuts.

Andreas used the pause to organize his thoughts. How much would he have to tell to be believed?

"My brother and I," he started, "are what I guess you would have to call empaths. We seem to be able to communicate with each other telepathically on a subconscious level." He paused to stir sugar into his coffee, and see how the colonel took that. The colonel said nothing; his face would have done him credit at a poker game.

"We found this out when we were quite young," Tom Andreas continued. "We were in the same class in school, and we used to split the studying for tests. Jimmy would study half the assignment, and I would take the other half. It worked quite well. I understand this is fairly common among exact twins."

"I wouldn't know," the colonel commented.

"I would. We checked. Jimmy and I seem to have this — ability — in a more developed state than most, but there are many examples of it."

"Go on," the colonel said, maintaining his poker face. "It seems to work as a sort of subconscious mutual memory. It only comes directly to the surface in time of crisis. Yesterday morning, when I woke up, I knew my brother had been captured somewhere in Russia. I couldn't possibly tell you how I knew this, I just did." Andreas thought of the searing mental cry for help that had awakened him at six in the morning, and the tense moments he had shared with his brother while waiting to see whether the State Internal Security Police were indeed taking Jimmy to prison, or whether they were arranging his "disappearance."

That much is true, he thought, *I can't tell the colonel how I knew.*

"The knowledge of what to do came to me as I needed it," Andreas continued, hoping his poker face was as good as the colonel's. "I bought a plane ticket to Denver. When I landed I got in a cab and told the driver this address. As I entered the building I knew what to do in the elevator." Andreas leaned forward across the desk. "Colonel, my brother needs help, and he needs it now."

Colonel Culverson stared through Andreas to the far wall, his face emotionless. Gradually he allowed his eyes to focus back on Andreas' face.

"How did you," he asked in a deceptively mild voice, "know the name of the town in Russia your brother was in?"

So that was the bone. Out of the whole impalatable story, that was the one part the colonel was not prepared to swallow. Andreas sensed that the colonel, as of that moment,

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did not disbelieve him, it was more a feeling of suspending judgment until all the facts were in.

"Out of the air," Andreas said, "like the address of this place. I suppose it was the stress of the moment, knowing that I had to be able to say something that would impress you."

The colonel chewed on that for a while. "You leave me," he said, "with the distasteful choice of either believing you or assuming that the brother of James Andreas is a Russian agent. Although I admit that I fail to see what the Russians would have to gain by sending you here. If you do have this — talent — why have you kept it secret all this time?"

Andreas grinned. "Colonel, admit it — you'd almost rather believe that I'm a Russian agent than to think that I'm a telepath."

Colonel Culverson nodded slowly. "The fact that you and your brother can — to whatever extent — read each other's minds introduces the unpleasant possibility that somebody can read mine."

"You see? And your next thought will be to find out how this ability works, and what you can do to guard against it. My brother and I had no desire to be experimented on. Besides, there has been too much correlation of telepathic ability with some kind of 'supermen', and we were very much afraid of public reaction."

"You thought it would be dangerous to admit this ability?" the colonel asked. "I had always thought the public was ready to accept telepathy. Look at the popularity of *The Great Bolini*, that mind reader on television."

"Bolini? Do you really think he can read minds?"

"Of course not. It's some sort of stage magic, clever trickery," Culveson admitted.

"I agree. And this is why he's accepted. The public is always willing to accept a clever trickster as a form of entertainment; if they thought he really could read minds they'd lynch him."

Andreas felt a subtle change come over the colonel as the career soldier, trained for many years to make decisions on the basis of the information available, made up his mind. Andreas searched for some clue in the colonel's mental attitude as to what that decision was, but he could empath nothing beyond the fact of decision.

"I have decided," the colonel unwittingly used the exact words Andreas had been trying to read from his emotional pattern, and almost made Andreas choke on his coffee, "to accept what you've told me without reservation."

It sounded good, but as the colonel paused Andreas could read a slight reservation in the colonel's surface emotions. After a second the reservation became clear; the colonel was determined to check into this matter of telepathy at the earliest opportunity. *Let him,* Andreas thought, *and good luck. I'll be very interested in reading the report he gets.*

"Do you know what your brother

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was doing in Russia?" the colonel asked.

"No," Andreas lied.

When the colonel made a decision he pulled all stops out. "You have a security clearance from your work with language computers," he said. "Here, read this."

So, Andreas thought while the colonel slid a printed form across the desk, *Culverson does know all about me. I thought he was just fishing for time when he seemed unsure of my background. A smooth character, the colonel.*

The four-page form was headed *Briefing Document,* and contained excerpts of the various laws pertaining to classified material. Most of the excerpts terminated with the words "will receive a sentence not to exceed twenty years in prison," or, alternatively, "will be shot." Not a very reassuring document.

The colonel handed Andreas a pen. "Sign it at the bottom," he said. Andreas did so.

"Congratulations," the colonel said, extending his hand. "You are about to be sworn into the Army of the United States, Special Operations Branch."

The colonel called in the sergeant from the next office and had him witness Andreas swearing to uphold the Constitution. When the sergeant left, Andreas turned to Colonel Culverson. "Very impressive," he said. "How does this help my brother?"

Colonel Culverson swiveled his chair and stared at the seascape, presenting his profile to Andreas. "The question is," he said deliberately, "whether or not we *are* going to help your brother. You're going to help us decide; but first you have to know what we — and Jim — are doing." The colonel paused to look at Andreas, who contented himself with nodding.

The colonel continued, "since the signing of the Atomic Weapons Production Treaty four years ago, our branch has had the job of locating A-weapon units and final assembly plants in foreign countries."

"I thought that was done by international inspection teams."

The colonel nodded. "The teams inspect and close the plants down if they find them. But the teams are only allowed so many inspections per year in each country; the number of inspections being proportional to the land mass of the country."

"I know that," Andreas said.

"It's reached the point where the teams only inspect when they receive an 'informal' request from a member country. Their idea is 'you find 'em, we close 'em down'. Under the inspection rules as they now stand, that's the best they can do."

"And my brother . . ."

"He was checking a report that the Russians have set up a final assembly plant somewhere around Tradesgodork. It's a part of Russia that's closed to tourists; so if the Russians choose to call him a spy, we can't really argue."

"Colonel Culverson, I'm not interested in what the Russians call my brother, I'm interested in getting him out of a Russian prison."

"Professor Andreas, your brother

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is one of my close friends, but as commanding officer of this unit I don't see how I can justify a prison break. If we get an inspection team over there, we might be able to get him out in the general confusion, but that's the only way I can see. And to authorize our 'suggesting' to the Control Commission that they send out a team, I'd have to have some pretty clear indication that the plant is in the Tradesgodork area."

"Isn't the fact that they've captured my brother a good sign that they've got something to hide?"

"It could be. Or it could be just a way of making us think that they've got something to hide so we'll waste one inspection finding out that they don't."

"So what do we do — let my brother rot in prison until they decide whether to return him or shoot him?"

"Can you — communicate — with your brother at all now?"

"No. I'm much too far away. In another moment of stress I might, but I'd rather not hope for that."

"You mean you could if you were closer?"

"Yes, within ten miles or so. Of course I can still only get emotional patterns, but it's possible to tell an awful lot from that."

"Do you think you could tell whether Jim had found anything or not?"

"Yes. Only generally, of course, not specific detail, but at least a positive yes or no."

The Andreas brothers held their breath while the colonel stared through Tom.

"How is your Russian?" the colonel asked, finally.

"Fluent," Tom said, and Jim started to breath again.

"If I get you to within ten miles of your brother, do I have your word that you'll give me that positive yes or no before you try rescuing him?"

"Yes," Thomas Andreas said.

II

The little sailplane glided silently through the thin air. The quarter-mile of tow cable dipped in a gentle parabola before it rose again to fasten to the stubby reconnaissance craft in front. Andreas watched the cloud cover far below as it passed under him, shimmering in the heat pattern of the powerful jet exhaust at the other end of the cable.

He kept checking the altimeter and air-speed indicator, his only two instruments, as though he had some control over their readings. One hundred ten thousand feet, the altimeter stated; twelve hundred miles an hour, the air-speed indicator approximated. Even with his lack of control over the facts, Andreas found the knowledge comforting.

"Good morning, Professor," the sudden voice in his earphones jarred Andreas out of the semi-euphoria he hadn't realized he was in. "Comrade has finally decided to send up a few interceptors; if you don't want an escort in, you'd better release the cable."

"Right," Andreas said, before remembering that it was a one-way

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connection. The sailplane was made completely out of plastic, and every bit of metal that was not absolutely essential had been removed. Andreas reached down and pulled the cable-release lever. The sailplane dropped away, and Andreas watched the tow-rope disappear as a powerful winch in the recon plane pulled it in. The reconnaissance craft kept going in a straight line until the rope was in, and then curved away toward the west into the setting sun.

In a very few seconds the glider had reached the level of the cloud blanket, and buried itself in the white fluffy mist. It started to slow up as the knife-edge wings sliced through the thicker air. Andreas watched the air-speed indicator as the needle dropped lower on the dial. When it reached 700, he pulled a knob on the panel in front of him. Small slots opened on the surface of the wing, and then huge braking flaps rose on the wing's trailing edges.

Andreas was pulled forward against the safety belt as the plane shuddered and bucked. The air-speed needle dropped steadily, and then steadied at around 450 as the plane stopped bucking and started gliding smoothly through the air again. It was pitch dark in the cabin; at the altitude the plane was now, the sun was already well below the horizon. Andreas switched on the tiny instrument lights.

A jet, illuminated by its own exhaust, streaked by Andreas, climbing steadily.

One of the interceptors, Andreas thought. *He'll never catch up now.* The all-plastic sailplane, transparent to the Russian radar net, glided safely and serenely deeper into Russia.

Now came the part of the trip that the colonel had been most dubious about. The sailplane almost flew itself, and, as Andreas wasn't going to have to land it, Colonel Culverson hadn't been too concerned about Tom's supposed lack of experience; but the colonel was convinced that Tom would kill himself while parachuting out.

Andreas had been tempted to tell Culverson that every time his brother had jumped he had been an interested observer, but he restrained himself. It had taken some persuading to convince the colonel that Andreas really didn't need two months' training before jumping out of a plane.

Now, as the altimeter and air-speed indicator both crept toward the point where Andreas and the plane parted company, he wished he hadn't been so cocksure. Being "with" his brother when he parachuted was one thing, doing it himself was another. Of course he knew technically what to do, but he had never had to ask his nerves and muscles to respond to that set of orders. It was acquired but not yet innate knowledge that he would be using, and he would have to do every act consciously without being able to depend on sets of conditioned reflexes to take over any part of the job.

Andreas sighed and, taking several deep breaths systematically,

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pushed button one. He heard a steady whistling sound while the air pressure inside and outside the cabin neutralized, and then something seemed to pop inside his ears and the sound seemed much further away. He waited the specified minute, and then pushed button two.

The floor dropped out from under him, and then he was falling. For the first instant he felt a light-headed giddiness; then a strong sense of fear took over, an abstract sort of fear that he seemed to be able to analyze from a distance. *Another difference between Jim and me,* Andreas thought: *he does this for fun.* When the plane suddenly came to view on his left and then disappeared on his right, he realized that he was spinning.

That's supposed to be bad, he thought, and then, *the 'chute should have opened by now. I've been falling for at least ten minutes.* He felt a slight tugging, and then a giant slap as the parachute harness caught him up, knocking the wind out of his lungs. The 'chute had opened, and he dangled from it, swinging like the weight at the end of a pendulum.

Far above Andreas, and many miles ahead, a small oscillator imbedded in the plastic body of the glider switched on. It vibrated at the resonant frequency of the plastic, which picked up its oscillations like a sounding board and sent the vibrations over the structure of the plane. The vibrations amplified and went into harmonics, and then, in an instant, the plane was no more. A fine plastic powder spread over many miles, and small bits of metal and chunks of plastic dropped to imbed themselves in the farmland below.

James Andreas relaxed his body as completely as possible on the lumpy cotton mattress in his small cell, and concentrated on helping his brother. Tom's mind was acting as a relay between Jim's thought-instructions and Tom's muscles, but it was still a two-step process, lacking in coordination. *Relax,* Jim thought, *you're drifting too much to the right; spill some air out of the canopy. Touchdown coming. Straighten out, tense your legs — this way — that's it, now . . .*

"You there!" A guard banged on the door of the cell to attract Jim's attention. "Come with me."

The darker blackness of the ground reached up and smacked Thomas Andreas. His knees buckled, and then a gust of wind caught the canopy of the parachute and jerked him backward. He tried desperately to right himself, but something hard connected with the back of his head and the black fog of unconsciousness enveloped him as he came to rest on the ground.

Tom . . . Tom . . . wake up Tom . . . He stirred. A full orchestra of snare-drummers set up a steady cadence inside his skull. *Come on Tom, wake up. Tom!* He shook his throbbing head. The pounding came up to a full crescendo for a second, and then died down to a steady ache.

"What happened?" Tom didn't realize that he'd spoken out loud.

You banged your head.

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Memory came back to him, and the sense of *awareness* that he shared with his brother returned, so that verbalizing was no longer necessary. *It's not the first time that I've banged my head,* Andreas thought. He remembered the car accident when they were sixteen, so many years ago, and the eight months lying in beds across the room from each other so bandaged up that they couldn't move or talk. The sense had grown during this period. At first both of them had been afraid of it; it had come in little flashes and seemed more like madness than like a new sense.

During the last three months of this enforced idleness they practiced with their new ability until they knew each other well enough that words were no longer necessary to convey meaning. When they were able to get out of bed and start resuming a normal life, each found that the other was always with him. Although still maintaining separate personalities, and living separate lives, in a very real sense they shared everything they did.

Jim, back in his cell after several hours of interrogation, started singing *Auld Lang Syne* at the top of his lungs. This effectively stopped Tom's reminiscences, and sent a prison guard scurrying for his superior.

Tom tried to stand up, and was pleasantly surprised to find that there were no bones broken. He seemed to have nothing wrong beyond the trip-hammer pounding periodically inside his head. He checked his wristwatch and found that, although he had been unconscious for longer than he had thought, there were still several hours before dawn. Andreas took a small cardboard pillbox out of a pocket and, selecting two pills by the light of a small pocket flash, he chewed on them reflectively.

He released the parachute harness, stepped out of it, and rolled the harness, shroud lines and 'chute into as compact a ball as he could manage. Taking a folded-up plastic shovel out of a pouch on the side of his coveralls, he spent the next half-hour digging as deep a hole as he could in the moist black earth.

When the hole was deep enough Tom tamped the rolled-up parachute ball into the bottom. Unzipping his coveralls, he peeled them off and threw them in on top. Next the shovel went in, and his jump boots. He then opened a rubber bottle and poured the liquid over the pile, being very careful not to get any on him, and tossed the empty bottle in with the rest. Sizzling and crackling noises came out of the hole while he sat beside it and put on a pair of made-in-Russia shoes, and an acrid smell assaulted his nostrils. After a while the noise stopped, although the smell didn't let up. Tom took off his suit jacket and laid it carefully on a rock before he began scooping earth back in the hole with his hands.

When the hole was full Tom distributed the extra dirt around the area and then, getting up and brushing himself off as best he could, he stamped around for a while, tamping

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the ground with his feet. He took out a silverfoil packet and, opening it, used the specially treated moist cloth inside to clean his hands and face. He put his jacket back on, fumbling in the dark for a moment before he remembered that it was double-breasted, and then started walking.

In a short time Tom came to a paved road. He knelt down and used the rag to get as much of the farm dirt as he could off his shoes and then, balling the rag and tossing it into some nearby bushes, he mentally flipped a coin. The imaginary ruble came up heads, and Tom started down the road to his left. He walked smoothly, with a long stride and a fast, but not hurried, pace.

Several cars passed him, their headlights casting long pillars of white horizontally in the darkness. And then, just as the shadowless false dawn was beginning to light the horizon in front of him, an old truck coughed to a stop.

"Good morning, *tovarich,*" the old man in the cab smiled toothlessly, "may I offer you a ride?" He opened the cab door.

So it begins, Andreas thought. "Certainly, *tovarich,* I thank you for your generosity." He swung himself inside the cab, and slammed the door.

III

The old man clashed the gears, and the truck bucked forward and then settled down to a chugging pace. "May I ask where you are going at this hour of the morning?" the old man said.

Tom didn't know where he was to within a hundred miles. "To the town," he said, mentally crossing his fingers.

"To Khirta or Polentslobad?" the old man asked. While Tom tried to remember where that would put him, and which town was better for his purposes, the old man continued: "I, myself, am going to Khirta."

Tom decided in favor of direct transportation and answered, "that is a fortunate coincidence; I also must go to Khirta."

"And, if I may ask, where are you coming from?"

The old man was just being garrulous, the prerogative of the old everywhere in all times, but his questions were just as much of a test as a police interrogation. To refuse to answer would make the man unduly suspicious of this stranger he had picked up on a country road at night; to give a wrong or illogical answer could be fatal.

The rising sun ahead of him showed Tom that they were headed almost due East, and he thought he remembered the maps of the area fairly well. He decided to take a chance without waking his brother for advice. From what he knew of Soviet questioning techniques, Jim needed all the sleep he could get.

"I am originally from Moskva," Tom said, "I am in this area on a fact-gathering mission from my bureau. I spent last night in Otcherts, but it was essential that I get to Khirta by early morning, so I

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left before dawn. After a while my car decided not to go any farther; you must have passed it awhile before you reached me."

The old farmer shook his head in sympathy over the vagaries of machinery, but he didn't seem impressed by Andreas' implied government office. "My house is only a short distance before where I picked you up. Your car must lie somewhere behind."

"Of course." Tom breathed a secret sigh of relief. "About how far is it yet to Khirta?"

"About fifteen versts." The farmer used the old style of figuring distance, even though his speedometer was calibrated in kilometers. "We should be there in about half an hour."

Tom relaxed, listened to the old man brag about a new strain of wheat he was planting that Tom suspected must have come from the United States, although this was not the time to say so, and hoped that the venerable truck would rattle through to Khirta. Forty minutes later the truck wheezed to a stop.

"I'm going through to the cooperative fertilizer plant on the other side of town. What if I leave you off here in the square?"

"This will be fine, thank you, Grandpa." Tom stepped out of the truck, and gingerly to the ground, finding that his right leg had gone to sleep during the trip. "May you have an excellent harvest, *dos vidanya.*"

"*Dos vidanya.*" The old man waved to him, and the ancient truck chugged out of sight around a corner. Tom looked around him. He was indeed in a square. What appeared to be the town hall was to one side of him and directly opposite, across a rectangular lawn bearing a heroic statue of a woman on a tractor, was the railroad station. Rows of unimaginative three-story buildings filled in the rest of the square. A few workmen were plodding from one place to another, but no one looked up. It was much too early for anyone to be awake enough to take an interest in his surroundings.

Andreas walked over to inspect the train station, his primary concern. It was closed, and there were no schedules posted. He wondered how much time he had to kill, and then realized for the first time that he was very hungry. One of the buildings on the side of the square was marked HOTEL, and probably had a restaurant inside, but it, like every other building in sight, was firmly shut.

Tom stood undecidedly on the station steps for a minute, and then noticed that the few people in the street all seemed to be headed in the same direction. It could be an early-opening mill, but he decided to play a hunch. He followed the trend and, two blocks away, found a fairly dirty-looking restaurant that was opened, catering to the early-rising workmen.

Tom walked in with a self-assurance he didn't feel, and sat down at a table in front. The workmen were all gathered around three tables in back, drinking tea and not talking

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much. Alone at his table in front, and dressed in a dark blue business suit, Tom felt as conspicuous as if he had red, white and blue stripes painted in a spiral around his body.

A hostile-looking waiter, who looked as if he only worked at the restaurant between wrestling matches, thumped over to his table.

"Da?"

"Tea, if you please," Tom said in what he hoped was an official-sounding voice, "and also . . ." in a near-panic Tom suddenly realized that he hadn't the slightest idea of what people in this part of Russia considered a normal breakfast, ". . . something to eat," he finished, lamely.

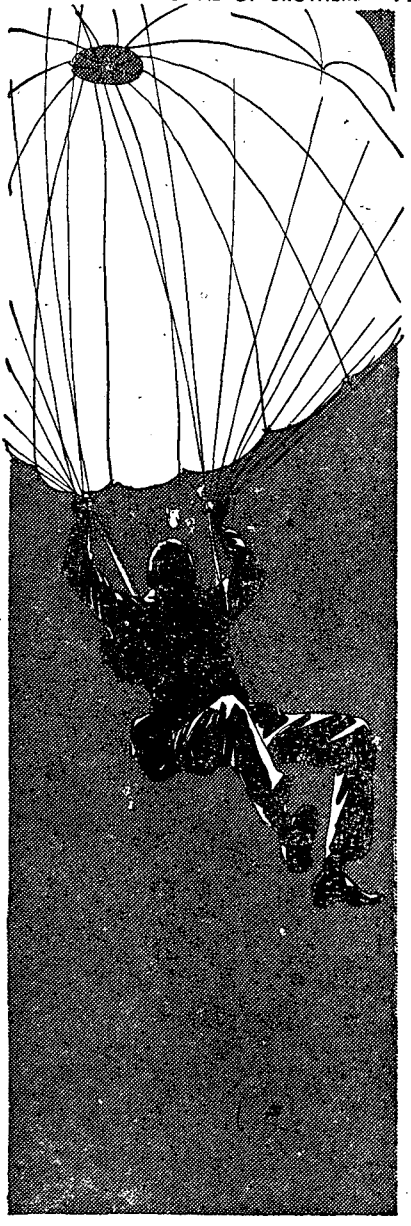
"To eat? What?"

"I don't want to put you out," Tom said, and waved his hand officiously. "Whatever you can put together."

"The cook is not here yet," the wrestler said, "but I'll see what I can do." He thumped away.

A short while later he was back. He put a mug of tea and a plate in front of Tom, glared for a moment, and then went away. The plate held a large piece of black bread, covered all over with thick slices of cheese. *A sandwich,* Tom thought, *progress.* There were no utensiles provided, so Tom folded the bread around the cheese and started to eat.

The bread was hard, crisp peasant's bread, with a flavor which made Tom understand why bread was called the staff of life. The cheese was bitter, but good. Tom



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quickly finished his improvised sandwich, and then sipped the tea. It was very strong, and had an unfamiliar musky aroma. The sugar, poured in from a bowl on the table, was in rock-hard large grains, and failed to dissolve in the tea.

Tom brooded over his tea, staring at the white crystals in the bottom of his mug. After a while the waiter came over with a pitcher and refilled the cup.

Tom looked up. "The bread and cheese were very good," he said. "I thank you very much."

The waiter smiled, and suddenly looked much less hostile. "My wife is the cook," he said. "She is out buying provisions this morning. It's a pity she isn't here, or she would fix a breakfast worthy of a commissar for you."

"It is indeed a pity, she must be a fine cook."

The waiter expanded visibly. "A very fine cook, ask anyone. What brings a fine citizen like yourself out at this hour?" No suspicion, not even much curiosity, just polite interest and an indirect compliment.

"I travel on government business," Tom said, wondering what the man's reaction would be if he knew what government. "I had hoped to catch an early train, but the station was still closed when I got there."

The waiter nodded. "The station opens at eight o'clock. The first train is at a quarter past the hour. What is your destination?"

"Tradesgodork."

"So. I believe the next train, at half past the hour, goes there, but you'd better check with the stationmaster."

"I shall, thank you again."

Tom lingered over his second cup of tea until eight o'clock, paid the 80-copek bill, decided against leaving a tip, and walked back to the railroad station. The station attendant verified the fact that the train for Tradesgodork left at eight-thirty, and Tom bought a ticket and settled down to wait.

The first train, which came in at eight-fourteen and left a minute later, was an old one, driven by a coal-powered locomotive that reminded Tom of the model train set he had artistically spread over the basement floor when he was a child. The second train, which Tom boarded when it arrived promptly at eight-twenty, was an ultra-modern Diesel. Tom went along the passage looking for an empty compartment. The train wasn't very full at this hour of the morning, but the few passengers it did have had distributed themselves out one or two to a compartment, and most of them were stretched out across the three seats fast asleep.

Tom found an empty compartment somewhere toward the middle of the car and entered it. Deciding on protective camouflage, he lay down across the seats on one side and closed his eyes. The train pulled out of the station, and smoothly picked up speed, rushing toward Tradesgodork and James Andreas.

A sudden jerking of the train, that almost threw Tom off the seat, woke him up. He had fallen asleep

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without even realizing it. Tom yawned, sat up and looked out of the window. The train was slowing down, coming into a station. After a minute the platform came into view. The large steel-webbed structure over the platform had a sign hanging down that translated to TRADESGODORK — MANUFACTURING JEWEL OF THE USSR.

The train came to a stop, and Tom climbed down onto the platform. He walked over to the exit booth and handed the remaining half of his ticket to a clerk. The clerk glanced at it, invalidated it, and handed it back. Tom walked rapidly out of the station.

While not exactly a large city, Tradesgodork was certainly of substantial size. Tom wandered around for a while to get his bearings, and then started for the address he had been given by the colonel. His brother had been there many times, so he was able to go directly to it.

It was an old house. The gray paint had been put on in the time of the Tsar, and the all-but-illegible sign used Cyrillic letters that had been abandoned when the written language was "modernized" shortly after the Revolution. Tom knocked on the door.

The man who answered was the one Tom had come to see. He knew James well, but he didn't spot the similarity of appearance through the dyed hair and subtly changed features. Tom's impression of the man was colored by James' prior knowledge. James liked this man, local agent for the "smuggling ring" that was the front for American agents in this part of the country. As far as the man knew, it was only a smuggling ring, and his only interest in it was in a steady supply of rubles for his own pocket.

He looked at Tom suspiciously. *"Da?"*

"Ivan Petrovitch?"

"I am he."

"I have important news. I come from the East."

"You are welcome here, stranger from the East."

"I was told of the welcome I might expect." The litany that identified Tom as one of the brotherhood of smugglers was done. "Where can we speak?"

The man stepped aside and allowed Tom to enter. He very carefully closed and locked the door and then led Tom past a clutter of cartons and into a back room.

"So. I welcome you to Tradesgodork. What can I do for you?"

"We received word that Alex, your connection, has been arrested. Is this so?"

"Yes. This is so, but none of us can figure out what for. They still don't seem to know of us—at least our contact with the police says no word has come down on anyone else."

"They could be waiting until they get complete information," Tom said, "before they pounce."

"That could be," the Russian answered, "but I doubt it. To get information on Alex's activities in this business, they would have to already have information on me; and that

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they do not have. No, I think that his arrest was due to some other indiscretion."

"Yes, I'm inclined to agree with you." Tom didn't add that the "indiscretion" was probably an undue interest in a mysterious heavily guarded factory several miles outside of town. "But it must be checked on for our own protection."

"Of course. Even though I keep telling myself that they're not on to us, and that Alex won't talk, still I worry."

Ivan Petrovich and the rest of the group that the Special Operations Branch worked through were committing the crime of capitalism, a very serious offense in the Soviet Union. They brought such goods as woolen sweaters to places where there was a shortage and sold them for their own personal profit. If caught, they would be subject to long prison sentences or, if the authorities decided to make an example of them, even the death penalty. Petrovich had good cause to worry.

"What do you plan to do?" he asked.

"Did Alex leave anything with you?"

"Yes, a suitcase, but . . ."

"Give it to me. It contains certain—equipment—that we cannot have fall into the wrong hands."

"Of course. It's in the small storeroom in back, I'll get it." The Russian left the room, and returned in a few moments with a small, well-worn leather valise. "Here it is. What else?"

"I hope—nothing. If you do not see me again or hear that I have been arrested, all will be good. Cross your fingers."

"I would pray for your success if I weren't an Atheist."

Tom shook hands with the Russian, and left the building. He took a bus to the outskirts of the city, and then started walking with the valise under his arm.

IV

James was awake now, lying in his cell. The Russians seemed to have lost interest in him, at any rate they were no longer questioning him in two-hour relays of interrogators. It was most probable, he reflected, that someone higher up had taken an interest in him, and he was about to be transferred to Moscow. By that reasoning, if something were going to be done, it had better be done rapidly.

Tom nodded agreement, and kept walking. After a while, he found a convenient field to cut across. It wandered up and down several small hills, and Tom soon found himself out of sight of the road and all alone. He settled down to wait.

It started to grow dark. Tom checked his watch; it was ten after seven, local time. Fifteen minutes left. Tom opened the valise and set it down on the hard ground. He peeled a layer of tape off around the rim, and carefully took out the copper wire hidden under the tape. There were six two-foot lengths of wire, all joined at the center. The

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lining at the bottom of the valise came out easily, and opened up to eight times the original size. Tom laid it carefully on the ground, and spread the wire over it. He then unscrewed one of the hinges on the valise and, releasing a catch under the handle, drew some insulated wire from the handle and plugged one end into the screw hole in the hinge. He fastened the other end to the carefully laid-out wire. It was now twenty after seven.

Tom turned the handle, now loose at one end, clockwise until he heard a click. A minute later the characteristic hum of a warmed-up radio receiver emanated from somewhere inside the valise. Four minutes later, just when the colonel had said the satellite would be overhead, the speaker came to life. *"Beep bip bip beep, beep bip bip beep,"* sounded in a steady pattern.

Using the catch button on the valise as a transmitting key, Tom sent the Morse code letters K-S over and over. *Dahdidah dididit, dahdidah dididt,* until the beeping sound faded out. Having kept his promise to Colonel Culverson, and sent the code that verified that the Russians had an assembly plant in the area—something he could have told the colonel in his office except that it would have given too much away—Tom got down to the serious business of rescuing his brother. He gathered the components of the little radio together, put them in the suitcase, pulled the *destruct* tab, and went rapidly away. Two minutes later a powerful explosion sounded from the area Tom had vacated.

Andreas took the next bus back to the city. He went directly to the prison, and walked around outside it until he reached the narrow strip of street that James could see from his window to verify its location. The brothers looked at each other briefly.

Tomorrow, if they don't move you before then, Tom thought, *nothing more to do tonight.* He sighed and walked rapidly away.

The next morning Tom was out of his hotel by seven thirty. He had a quick breakfast, and then went to the People's Administration Building on Marx Square. A sign on the wall directed him down a dimly lit corridor of the building to a door marked *Municipal Records.* He knocked on the door, and went in. A desk faced him, and behind the desk rows of closely packed shelves and file cabinets filled the room.

A woman appeared from somewhere in the banks of shelves and approached the desk.

"Yes, *tovarich,* what can I do for you?"

"Good morning, *tovarich.*" Tom took a large, well-worn leather case out of his inside pocket, and laid three identification cards, two documents and a pamphlet on the desk. "These will serve to identify me."

The identification cards were from the Commissariat for Internal Improvement and Beautification. The two documents were an authority and a request for assistance from the same organization. The pamphlet explained the noble ideals

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and accomplishments of the Commissariat.

"I require your assistance," Tom said, while the woman looked over the documents, if you have the time to spare. We are preparing a report on urban land utilization and improvement over the past twenty years. If you could possibly take some time off from your very-important duties, I would be forever in your debt."

The woman smiled and handed back the papers. "My office is yours," she said, "what do you wish to look at?"

Her polite visitor from the C for II and B settled himself at an old desk in the back of the room. He examined records concerning the railroad yards, the prison, the workers' cooperative apartment building, the block to the north of the prison, the water-works, the city's electricity-distribution system, the Glorious October Revolution Tractor Factory and other seemingly unconnected examples of urban land utilization. Toward lunch time he sighed and stacked all of the folders together.

"Thank you for your assistance," he said to the woman. "It will require a few days to correlate the information I have gathered this morning, but I may be back to bother you again toward the end of the week." The woman assured him that it was no bother at all, and he smiled and invited her to lunch with him.

Later that afternoon a workman showed up on the block to the north of the prison. He was dressed in a set of coveralls two sizes too big for him, that bulged from every pocket with various tools and pieces of equipment. Casually setting up a sawhorse to divert traffic from around a manhole in the middle of the street, he pried off the cover of the manhole, sat on the street with his legs dangling in the hole inspecting the contents of the pit, and then, finally, lowered himself into the opening.

After half an hour he came out of the hole, pulled the cover back on, and, with the sawhorse under his arm, walked down a side street and disappeared. If anyone had re-opened the manhole to look at his work, he might have wondered about what looked like the insides of an electric clock attached to wiring that led into the prison; but no one re-opened the manhole.

James Andreas, the prisoner known as "Alex", groaned loudly in his cell. When no one came, he groaned again. After a while a face appeared at the slot in the door.

"What is the trouble?"

"I don't know. My stomach . . . something . . . hurts." James tossed convincingly on his cot

"I'll get the doctor." The face disappeared from the small window, and shortly a very fat man in a black suit was admitted to the cell.

"Good afternoon, I am Doctor Tonyev. Where does it hurt?"

"My stomach, Doctor. I'm sorry to trouble you, it's probably only something I ate, but I'm in great pain."

The doctor put down his gray bag and set about efficiently prod-

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ding and probing his patient. He checked temperature, pulse and blood pressure before putting his instruments back in the case. "I can find nothing wrong," he said. "Possibly an attack of indigestion; I'll give you a powder." He put a white paper packet on the small table. "Take it with a glass of water."

"Thank you, Doctor. Tell me, if the pain doesn't let up — you can come back later?"

"I leave at six o'clock, but I can always be reached at home in case of an emergency." The doctor smiled tolerantly, and patted his patient on the arm. "Don't worry," he said as he left the cell, "you won't need me for any emergency."

"That's what you think, Doctor," the patient said under his breath, as he mixed the powder into a tumbler of water. The water foamed up alarmingly.

Later that afternoon, in another section of town, the workman reappeared. This time he was a telephone lineman. He scrambled up one of the poles, and carefully inspected a nest of wires coming out of a box on top of the pole. He isolated one of the wires from the others, and clipped on to it. He pushed a button on his handset.

At a house a short distance away, a phone rang. A middle-aged woman ran to answer it. "Doctor Tonyev's residence."

"May I speak to the doctor, please?"

"The doctor isn't in just now, may I have him call you?"

"What time do you expect him?"

"About six thirty," she answered politely.

"Thank you, I'll call back then." The party at the other end hung up.

The lineman gingerly attached a switch to the wire he had isolated and then climbed down the pole, trailing a thin wire lead behind him. He fastened the loose wire to the pole just out of reach of inquisitive children, and then walked off down the street. He spent the rest of the day making some unusual purchases at local stores.

That evening, a little after seven, the city prison's star prisoner started making noises again. A guard appeared in the window.

"What's the matter this time?"

"I don't know, my stomach again, but this time it's worse. Can't you do something?"

"The doctor has gone home, and I don't like to bother him for a bellyache. Besides, they're coming for you tomorrow, and they have excellent hospital facilities in Moskva."

The prisoner groaned again, sharply this time, and then: "Oh my God, something's burst inside. I think it's my appendix. Oh, it hurts!"

"Just stay there," the guard said, somewhat unnecessarily, "I'll have the doctor called right away." He went away. A minute later the head warder looked in, but a couple of loud groans sent him scurrying away too. The prisoner was to be turned over to Central Authority in Moscow the next morning; it would never do to have him die tonight.

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A few miles away, a well-dressed man stopped by a telephone pole. He reached up and connected a telephone handset he was carrying to a loose wire dangling down the pole. A quick jerk on the wire flipped a switch that put it into the central circuit, and took another phone out. A passing couple looked at him curiously, but he ignored them with a majestic innocence.

The handset buzzed softly, and its holder pushed a button. "Doctor Tonyev here."

"Doctor? This is Kalinsky at the prison. I'm sorry to bother you after hours, but the man you examined this afternoon seems to be having an attack of something; he says he's in great pain."

"Yes? That is entirely possible, although I did not think the crisis would come so soon. I cannot come myself, but I will send a man who's an expert on these matters. His name is Doctor Alexanderov."

"Alexanderov? I will leave word at the gate that he is to be admitted. How soon do you think he can be here?"

"Oh, I would say within half an hour."

"Very good Doctor, thank you for your trouble."

"No trouble at all, believe me. Good night."

"Good night Doctor." The man at the other end hung up, and the well-dressed man released the button he was holding and unclipped the handset. With a quick glance to see that no one was watching, he dropped the handset into a street drain on the corner and, picking up a black bag, went on his way.

Two blocks away, in the yard of a small manufacturing plant that was closed for the night, there sat what Andreas considered to be the most beautiful small panel truck he had ever seen. Andreas entered the yard and, without hesitation, strode directly to the truck. He lifted the hood and searched out the wires leading to the ignition switch.

A flashlight suddenly went on, illuminating Andreas, and the old man behind it came threateningly into the yard. "Here now, what do you think you're doing?"

Andreas straightened, and turned around. "You must be the night watchman," he said, advancing toward the man. "Don't get excited; I was sent here by . . ." He slugged the old man regretfully but firmly across the top of the head with a sock full of sand that he had pulled out of his pocket, and the man crumpled to the ground.

He dragged the body into the deep shadows in the corner of the yard, and then checked the man's pulse. It was still strong. "Sorry old man," he said, "but my need is greater than thine. To each according to his need, you know." He tied the man's hands and feet, and then went back to his work under the hood of the truck. He pulled several wires loose, and touched them together; the motor started.

"Delightful," he said to himself. He took a length of two-wire cable from his pocket, spliced one end onto the lose wires, and brought the other end into the cab

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of the truck. Closing the hood, he put the black bag on the floor by his seat and started the truck. It started easily, and he pulled out of the yard and headed toward the prison.

He stopped the truck on a side street two blocks from the prison, walked the rest of the way, and presented himself at the prison door.

"Doctor Alexanderov," he said to the guard at the door, "I am expected?"

The guard pulled a bolt, and opened the heavy wooden door. "I have word to admit you," he said reluctantly. "Wait in there." He indicated a small room.

Andreas settled himself in the room. A minute later a large man came in and extended his hand. "Doctor Alexanderov? I am Warden Kalinsky."

Andreas shook the warden's hand. "A pleasure, *tovarich*," he said briefly, "where is my patient?"

"Upstairs. I will take you to him." The warden led the way up two flights of stone stairs. As the warden made the turn in the first flight, Andreas took something from his bag, and fastened it high up on the stairway wall while he was out of sight. The warden didn't notice the doctor's brief lag in keeping up.

At the top of the second flight, the warden led the way past a small guardroom, two locked doors, and into a corridor. Four doors down they stopped, and the warden unlocked a cell door. "In here," he said. The warden and one guard stood in the hall while Doctor Alexanderov went into the cell.

The man in the cell was lying on his cot, moaning softly to himself. He looked up when the door was opened. "Are you a doctor?" he said.

"I am. Let me have a look at you." After a few moments examination, the warden saw the doctor take a hypodermic out of his bag, fill it from a small bottle of colorless fluid, and inject the man in the upper arm. The man soon stopped groaning, and fell asleep.

The doctor looked up. "I've put him to sleep," he said to the warden. "It's quite serious; I'm afraid I'm going to have to perform an emergency operation right now. Have you any place with better lights?"

The warden considered. "There's a room up on the next floor," he said.

"Have you a stretcher?"

"One can be obtained." The warden spoke to the guard, who hurried off, and came back shortly with a canvas stretcher.

The warden took the stretcher. "Go bring back another guard to help you carry it," he snapped.

"No need," the doctor said, glancing at his watch. "Time is growing short. I myself will carry the other end of the stretcher."

They gently loaded the prisoner onto the stretcher, and started off; with the guard carrying the front, and the doctor the back. They went through two locked doors; the guardroom; and into the stairwell. They started up the stairs.

The lights went off. The quiescent prisoner came to life, and grabbed for the guard. The doctor turned around, releasing the stretcher, and

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chopped savagely at the base of the warden's neck. Guard and warden collapsed.

The two brothers started to run downstairs. Suddenly the emergency lighting system went on, dimly illuminating the staircase. The second floor door burst opened, and two guards ran onto the staircase. One brief look at the men crumpled on the floor of the landing was enough, and the guards started running downstairs, chasing the receding sound of footsteps. A hissing sound came from below the guards, and the stairwell started to fill with a choking gas. Wheezing and coughing, the guards were forced to retreat from it.

The brothers were at the first floor. Tom produced the warden's key, and unlocked the landing door. A startled guard in front of them struggled to pull the pistol from his holster. Tom shot him in the face with a water gun. His hands flew to his eyes, as the stinging blinded him.

"Only ammonia," Tom told him, and then hit him over the head with the sand-filled sock. The brothers pulled the bolt to the front door, and walked calmly on to the empty street.

Tom drove, while Jim changed clothes in the back of the truck; after a short time, they changed places.

The last thing was the careful application of makeup. They parked a short distance from the railroad station, got out of the truck and surveyed each other.

We'll do, they agreed.

The station guards had been alerted about the prison break, but no extra help had reached them from the police station yet. They closed down all but two of the entrance booths to the track area, and scrutinized everyone who went through. There was a small crowd to check, as the Moscow Express was due.

Eventually two Chinese gentlemen, in the black trousers and mattress-design jackets that were the unofficial uniform of Chinese officialdom, came to the front.

"Is official Russian policy to harass travelers?" the one in front asked coldly.

"There's been a prison break."

"Ah! Example of Russian efficiency."

The guard stiffened. "At least we don't have to wear mattresses," he said. "What did they do with the rest of the mattress-cover when they cut that jacket?"

The Chinaman bowed. "Is in back of truck we used to break out of prison with," he informed the guard.

The guard glowered, and passed them through.

The Moscow Express came in, and left, on time. Fourteen hours later two official-looking Oriental gentlemen walked into the American Embassy in Moscow, and requested an audience with the Ambassador.

Within three hours, the Andreas brothers were on a plane non-stop to New York.

That was fun, they thought jointly, *now comes the hard part: explaining the escape to Colonel Culverson.* END

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EXPLOSIONS IN SPACE

by BEN BOVA

Space explosions come in a nicely graduated series: Variables, flare stars, novae and supernovae . . . and the "unusual" galaxies!

Poets speak of the eternal stars and the tranquil heavens but astronomers know better. There are explosions in space that make man's puny efforts at destruction look like child's play.

The sun itself undergoes many explosions per year, called *solar flares.* Flares are only trivial explosions, as far as the stars are concerned. A flare will only control all the physical events in space between the Earth and sun for a day or so, ruin man's attempts at long-range radio broadcasting, and kill any unshielded astronauts that happen to be in its way. Trivial.

Nova explosions are more spectacular. A star will blow off its entire outer envelope of gases — its atmosphere. *Supernova* explosions are even more stunning; they literally destroy the entire star.

Tremendous as these celestial fireworks are, though, they're tiny when compared to the staggering spectacular astronomers have discovered within the past year or so: *whole galaxies are exploding.* Giant aggregations of stars such as our own Milky Way (population: 100 billion stars) are blasting apart with the energy of millions of supernovae. Why? Where does all this

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energy come from? Does this happen to all galaxies — including our own?

To understand the enormity of these galactic explosions, and of the problems raised in explaining them, it would be helpful to quickly review the smaller, stellar types of explosions.

Solar flares are relatively short, sharp explosions that occur on the sun's surface. They are usually associated with sunspots. But the exact causes of solar flares are largely unknown. Apparently, the strong magnetic fields associated with the sunspots suddenly dump their energy into the gases — which are at temperatures of 4,000 to 6,000°K — and the reaction causes an explosive outburst of the gases.

The energy released by an average-sized flare is about 10^{33} ergs. For the sake of comparison, the Hiroshima nuclear bomb released some 10^{26} ergs, or 10 million times less than a solar flare. Even a 100-megaton fusion bomb would give only about 10^{30} ergs, still a thousand times less than a flare. While these numbers seem large, they will soon be dwarfed.

A more useful comparison of energy output would be to compare the flare to the length of time it takes the entire sun to produce as much energy. The sun gives off about 10^{34} ergs per second. Thus it would take the entire sun only a tenth of a second to produce the energy required for a flare, although it takes about an hour or so for a major flare to go through its entire life cycle. You can easily see that a flare is a rather mild occurance in terms of solar energy, violent though it is in human terms.

And solar flares are violent. They are more energetic than anything else in man's experience, except for the celestial explosions we shall discuss in a few moments.

Although it takes only an hour for a large flare to be born and die, its effects are felt between the sun and Earth for the next 24 to 48 hours. The flare shoots out a stream of electromagnetic energy, charged nuclear particles, and an ionized cloud of gas that contains its own magnetic field.

A large solar flare can buckle the Earth's magnetic field, light up the aurorae, blank out short-wave radio reception, and even interfere with telephone communications carried by cables at the bottoms of the oceans! There may be some subtle connection between solar flares and terrestrial weather. And for men in space, large flares can drench unshielded ships or lunar surface bases with killing radiation. Fortunately, Earth's magnetic field and atmosphere protect us from these lethal effects of solar flares.

And that is the smallest type of explosion in space.

Many stars go through a nova phase. Every year some two dozen stars in our Milky Way will flash into nova explosions.

There are several different types of nova explosions, and many theories as to what causes them. One thing is certain: a nova star has reached a critical point in its

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Fig. 1. SOLAR FLARES
The Sun is a flare star. Solar flares, usually associated with sunspots, are definitely known to cause certain effects on Earth. Among them are: interference with wireless radio and other electronic communications (such as radar); intensification of the Northern and Southern Aurorae; and possibly some secondary effects on terrestrial weather. In addition, flares can produce lethal levels of radiation in space, and may be extremely dangerous to unshielded astronauts.

evolution. The outward-pushing forces of gas pressure and radiation pressure win a temporary victory over the inward-pulling force of gravity. In our sun, these two forces are in balance, and the sun remains stable and perfectly spherical. In a nova star, the outward-pushing forces of gas pressure and radiation forces overpower gravity, and the outermost layers of the star's gases are blasted away into space.

The most frequent types of novae are the so-called *dwarf novae*. These are the mildest type of all, and apparently happen only to small, reddish, dwarf stars that are members of a closely coupled double star grouping. A dwarf some 10 to 100 times dimmer than the sun will suddenly explode and flare into a brightness equal to the sun's. Peak brightness is reached in a few hours. Within a few days, the star has returned to its former humble ways. Dwarf novae are repeaters. They will explode as often as 30 times per year. Obviously, such explosions are not hurting the star too much.

A full-sized nova is more impressive. An apparently normal star — usually more aged than the sun — will erupt into 5,000 to 100,000 times its original brightness. The peak of brightness is usually reached within a day or two; then the star slowly settles back to its original luminosity over the course of a few months. Ordinary novae are non-recurrent, although a few have been observed to repeat in intervals of 10 to 100 years. Perhaps all novae are repeaters, and most of them simply have a long time cycle.

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For all its brilliance, even a full-sized nova does not drastically damage the star. The explosion blows off only about a hundredth of the star's mass. In terms of energy, a nova uses up about 1,000 years of the star's usual energy output within a month or so (assuming the star has an energy output roughly similar to the sun's). Since normal stars can radiate energy at the sun's pace for several billion years, 1,000 years worth of energy is only a small fraction of the star's available resources.

Nova explosions are spectacular, but no more dangerous to the star than the loss of a pint of blood to a human being. However, nova explosions are symptomatic of the fact that the star is aging and reaching critical imbalances that will eventually destroy it.

The effect of a nova on nearby planets is something else again. If the sun should go through a nova phase, it would hurl out a shell of fairly dense gases at temperatures of at least several thousand degrees Kelvin. At the very least, Earth's air would be heated to the point where every flammable object on the surface would burn — forests, grasslands, cities. Very probably, the air itself would be boiled away. If the oceans were not vaporized in the first flash of heat, they would soon evaporate, without an atmosphere to protect them. Some of the water would escape into space; much of it might remain gravitationally tied to Earth in the form of steam clouds.

Earth would then resemble our present-day description of Venus: cloud-covered, barren, devoid of liquid water.

If a nova would destroy life on Earth, a supernova might destroy the entire planet. For supernova explosions are the ultimate in stellar violence.

A supernova is the penultimate stage of stellar evolution. A star evolves — ages — by thermonuclear conversion of its mass into energy. First hydrogen is converted into helium — our sun is going through this stage now, and should continue to do so for several billion years. Eventually, as the hydrogen is used up, and the star's central temperatures rise, helium begins to "burn" and produce heavier elements: oxygen, neon, and carbon. With growing swiftness the star gets hotter and begins new cycles of element-conversion. Ultimately it begins producing iron at its core.

The central temperature of the star is now measured in billions of degrees. Under these conditions, the star begins to produce massive numbers of neutrons. When the temperature reaches a high-enough point, the neutrons produced are so numerous that they carry *all* of the star's heat energy away into space inside of 24 hours. The star is suddenly bankrupt.

The outer layers of the star, pushed out from the fiercely hot core by intense gas and radiation pressures, suddenly have no outward-pushing forces working on them. Gravity remains, though, and the star's outer envelope catastrophical-

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Fig. 2. NOVA STARS

If the Sun should become a nova, life on Earth would be almost instantly destroyed. Our planet's atmosphere and oceans would be boiled off. Combustible material on the surface of Earth, such as vegetation and buildings, would burn.

For other stars, distance protects us. If Alpha Centauri — our next nearest stellar neighbor — should become a nova, there would probably be no discernable effect on Earth at all, except for an obvious brightening of the star we now see.

ly collapses into the core. The result is a titanic supernova explosion.

Supernovae can shine with the brilliance of 100 million suns. And no wonder: within a few hours, a billion years worth of stellar energy are released. After a supernova, the star has practically no more energy to give, except that released by gravitational contraction. It has used up almost all its nuclear energy.

Astronomers are divided over the question of whether anything at all of the star survives such a blast. Perhaps the star is utterly shattered, and all its mass is blown into space, eventually to join with other gases and create new stars. More likely, though, at least some of the star remains, probably as a small, hot, dense white dwarf.

Recently it has been conjectured that supernovae might leave behind an ultra-dense neutron star — a dark sphere only some 10 miles in diameter, but still almost as massive as the sun. To fulfill both those conditions, a neutron star would have to have a density equal to 100 million tons per square inch! As its name suggests, a neutron star would consist almost entirely of neutrons, squeezed together so tightly that they physically touch each other. The central temperature of a neutron star may be as high as six billion degrees Kelvin, and its surface temperature between one and 10 million degrees. The star would radiate x-rays, not visible light.

Several sources of ex-radiation have been detected by rocket-borne instruments. (X-rays are absorbed by Earth's atmosphere and thus can-

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not be detected from the ground.) Significantly, at least one of these x-ray sources is located at a sight long known to be the remains of a bygone supernova explosion: the Crab Nebula. However, a rocket-borne experiment conducted in July 1964 showed that the x-radiation from the Crab Nebula is more probably coming from a cloud of hot, ionized gas about a light-year wide, and not from a pinpoint source such as a neutron star.

The Crab Nebula is a wildly distorted cloud of gases some six light-years in total diameter. Chinese and Japanese astronomers (and cave-dwelling Indians in our own Southwest) observed and recorded in AD 1054 a brilliant "new" star that shone even in full daylight. Today the gases in the Crab Nebula are still rushing outward from the common center at speeds of several hundred miles per second. This, some 900 years after the explosion!

The Crab Nebula is not only a dramatic visual and x-ray object it is also a strong source of radio noise. The Russian astronomer I. S. Shklovsky showed that the radio energy coming from this Nebula is due to synchrotron radiation — free electrons in the gas are accelerated by powerful magnetic fields until they radiate at radio frequency.

Several other strong radio sources within the Milky Way have been identified with the remains of supernova explosions long past. We shall see that other, even stronger radio sources are the results of even greater explosions, far deeper in space and time from the Milky Way.

Now we leave the confines of our own galaxy and consider the universe of galaxies. To date, more than a billion galaxies have been observed, stretching out farther and farther into space. There are three main types of galactic structure: spiral, elliptical, and irregular.

The Milky Way is a giant spiral, about 100,000 light-years across and 30,000 light-years thick at its center. It is surrounded by a spherical halo of globular star clusters, each of which contains between 10,000 and 1,000,000 stars. The entire galaxy probably includes 100 billion stars, plus considerable loose gas and dust that are constantly producing new stars.

The great spiral in Andromeda is considered to be practically a twin to our Milky Way. The Andromeda galaxy is called M31, since it was listed as the 31st entry in Messier's 18th-century catalogue of "nebulae."

Large galaxies such as our own and M31 radiate about 10^{44} erge/sec of power in optical (visible light) wave lengths. This is about 10 billion times the power output of the sun. Considering that most of the Milky Way's stars are fainter than the sun, this correlates nicely with the estimated 100 billion population of our galaxy.

Galaxies also emit radi-wavelength energy, on the average at a rate of about 10^{39} ergs/sec. While this is an enormous amount of power, it is still only a hundred-thousandth of the optical wavelength output. However, these numbers are for typical galaxies only; we shall soon see that the most interesting

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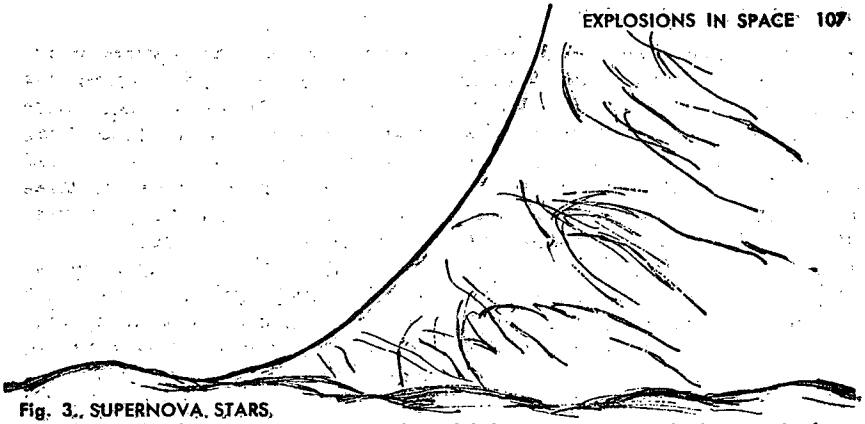

Fig. 3. SUPERNOVA STARS.

If the Sun became a supernova, the solid body of Earth might be completely destroyed. Certainly, much of the planetary crust would be liquified and perhaps even vaporized. If enough of the Earth's crust and mantle were boiled away, the core of our planet might explode, due to the sudden release of pressure from the overlying material.

The effect of Alpha Centauri becoming a supernova would probably be negligible to us. Even if all the energy of the supernova explosion was converted to gamma radiation, the effect on Earth would probably be no worse than that of an average solar flare.

galaxies are decidedly non-typical.

In 1943 the astronomer C. K. Seyfert called attention to the fact that a few galaxies showed peculiar characteristics in their central cores. There are now nine well-studied galaxies showing these peculiarities, which earn them the label of *Seyfert galaxies.*

Seyfert galaxies are marked by an unusually bright core, or nucleus. There is evidently considerable loose gas in the central regions of such galaxies, and the gas is in violent motion. Seyfert showed that the gases are moving with speeds of about 4,500 km/sec. The atoms in the gas are highly ionized and excited; that causes the unusual brightness.

For nearly 20 years Seyfert's discovery was just another piece of interesting, unusual data in the great storehouse of astronomical knowledge.

But during those 20 years, radio astronomy was born and advanced into a vigorous maturity. Radio telescopes began to investigate the galaxies, and found that some very ordinary-looking galaxies were unusually strong emitters of radio waves.

The giant elliptical galaxy M 87 is part of the Virgo cluster of galaxies. To optical astronomers, M 87 is slightly unusual in that it is very large, nearly circular in shape, and has an extraordinarily large number of globular star clusters surrounding it.

To radio astronomers, M 87 is even more unusual. It is one of the "brightest" — in radio frequencies

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— of all galaxies. M 87 emits more than a thousand times the radio output of typical galaxies: about 2×10^{42} ergs/sec.

Once M 87 was shown to be highly unusual in radio output, the optical astronomers began to study it more closely. Instead of taking long-exposure photographs, which show the faintest parts of the galaxy but overexpose the star-crowded central regions, they used short exposures to study the nucleus of the galaxy.

Streaking outward from the nucleus, they found, is a luminous jet of highly excited gases, some 3,500 light-years long. Nothing like this had ever been seen before. Galaxies are usually very symmetrical and stable, except for the small irregular types. A giant elliptical such as M87 was presumably a very old, stable galaxy. The jet standing out at one side of the nucleus ended that presumption. The nucleus of M 87 is also unusually bright.

The jet is responsible for much of M 87's intense radio emission. It is giving off synchrotron-type radio waves, much as the Crab Nebula does.

Radio astronomers have also found many other, normal-looking, galaxies that are strong radio sources. Normal galaxies emit radio noise mainly from the nuclei. The so-called "radio galaxies" put out about 100 times the radio power of a normal galaxy. Moreover, their radio emission comes not from their nuclei, but from areas outside the edges of the optically visible galaxy. It appears almost as though the galaxy threw off some material that is wafting away into space, too faint now to be seen, but still emitting strong radio signals.

Now we shift to another scene.

Radio astronomers have discovered many powerful radio sources in the sky. The Third Cambridge Catalogue of Radio Sources lists 470 strong emitters.

Some of these sources are galaxies, normal or unusual. Some of them are invisible to optical telescopes. Nine of them — to date — have been found to give the optical appearance of very faint stars.

But they are very peculiar "stars". Their spectra — the rainbow-like "fingerprints" that identify a star's chemical composition and other characteristics — resemble no ordinary star's. The spectra also seemed to indicate that the gases giving off the light were in a state of tremendously energetic agitation. Puzzled, astronomers called these nine objects "quasi-stellar sources". The name was quickly abbreviated to *quasars*.

Measurements of the quasars' energy emission were made. The results sent a shock wave through the entire astronomical world.

The quasars are pouring out some 10^{44} ergs/sec of radio power — 100,000 times the radio emission of ordinary galaxies! Their output in the visible wavelengths is 10^{46} ergs/sec — a hundred times greater than the total energy radiated by the entire Milky Way! The quasars, then, are putting out as much power as *10 trillion suns!*

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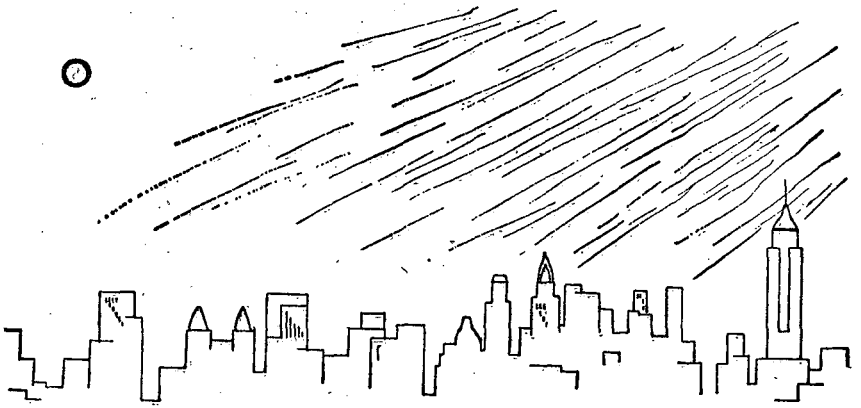

Fig. 4. GALACTIC EXPLOSION

If the Milky Way exploded, as other galaxies have been observed to do, the possible effects on Earth are largely unknown at this time. We are some 30,000 light-years from the galaxy's nucleus, where the explosion would occur. Between us and the nucleus are dense dust clouds that shield us from the optical light of that star-rich core. And the galaxy's magnetic field is shaped so that we are apt to escape the full brunt of an explosion. However, the radio energy liberated by such an explosion might make some interesting problems for electronics engineers!

Such tremendous numbers staggered even the astronomers, who are accustomed to numbers that make the National Debt look like cigarette money.

Because their spectra were so puzzling, Maarten Schmidt of Palomar suggested that the quasars might be showing a red-shift. That is, their spectra might be shifted toward the red, as are the spectra of very distant galaxies.

The suggestion worked. The quasars' spectra turned out to be those of ordinary chemical elements — under highly excited conditions — that showed very large red-shifts.

Remote galaxies show red-shifts because, presumably, they are moving away from us. The red-shift is interpreted as a simple Doppler effect, similar to the lowering pitch of a train whistle as it speeds off into the distance. Since the 1920's, cosmologists have explained that the universe is apparently expanding, and all the galaxies are rushing away from each other. Moreover, the farther the galaxy, the faster its speed of recession. Red-shift measurements are used to determine how fast a galaxy is moving away from us, and how far away it is.

The quasars showed tremendous red-shifts, greater than those for the most remote known galaxies. The question then arose: Are the quasars actually galaxies that are so far away that they appear as faint points of light? The quasar 3C 147 (3C=Third Cambridge Catalogue) is estimated to be on the order of six to ten billion light-years away; the farthest object known to man.

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However, the quasars are unusually small in optical dimensions, about one-sixth the size a normal galaxy would show at such distances. Are we seeing only the very bright nucleus of a very remote galaxy?

Some astronomers have an alternative explanation. They reason that the quasars are neutron stars, and the observed red-shifts are caused by the enormous gravitational drag exerted on the light they emit. Since neutron stars are both incredibly small and incredibly dense, their gravitational fields should be titanic. More then enough, it is reasoned, to shift x-ray wavelength energy down to visible light wavelengths.

Calculations have shown, though, that for a neutron star to produce all the effects shown by the quasars, it would have to be very, very close to Earth. Possibly as close as the Moon! If a neutron star were that close, its gravitational effect would prevent the planets from following nearly circular orbits around the sun. Kepler would have discovered such a star in the seventeenth century!

It appears very likely, then, that the quasars are galaxies — but very unusual galaxies.

At least one quasar, 3C 273, has shown fluctuations in brightness over periods shorter than a year. How can a galaxy fluctuate so? It would require the simultaneous brightening and dimming of billions of stars. And the fluctuations could not be caused by a disturbance, such as a shock wave, simply because such a disturbance could not travel across the length of a galaxy in less than a year. Galaxies are thousands of light-years across; a shock wave could not travel faster than light. Could it?

A possible explanation — though a shaky one — is that the quasars we see are only the small, dense, extremely bright nuclei of galaxies. But such nuclei would have to be less than a light-year in diameter to explain the brightness fluctuations by any known mechanism.

Despite the problems and interpretations, it seems very likely that the quasars are galaxies in the throes of explosion, violently hurling enormous quantities of matter away from their nuclei, blasting apart with the force of a billion supernovae. A final piece of evidence toward this point of view comes from another galaxy, very much closer to home.

M 82 is a well-known galaxy, a "scant" 10 million light-years (not billion) from the sun. Until the late summer of 1963, M 82 was considered to be an irregular galaxy — that is, its shape was neither clearly spiral nor elliptical.

In 1963, Allen R. Sandage and C.R. Lynds, working with the 200-inch Palomar telescope, examined M 82 more closely. They studied the light produced by ionized hydrogen, which is very often a key to the most energetic events going on in a star or galaxy. It takes energy to ionize atoms, strip electrons from them. And the amount of ionized hydrogen, which is often a key to the most energetic events going on in a star or galaxy. It takes energy to

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ionize atoms, strip electrons from them. And the amount of ionized hydrogen is an indication of the energy being released in the system.

What they saw was startling.

In other optical wavelengths, M 82 appeared to be an irregular galaxy. But the ionized hydrogen light showed what was invisible before. The center of the galaxy is exploding, shooting mammoth filaments of hydrogen gas more than 10,000 light-years out from the nucleus at speeds of 1,000 km/sec or more. It now appears that M 82 may be a small spiral galaxy that is in the process of exploding. Interestingly, the filaments of outrushing gas seem to be following magnetic lines of force that lead out from the nucleus.

Radio astronomers have also shown that while M 82 is a relatively weak radio source, its major emission comes from a very small region in the nucleus, and from synchrotron radiation along the outward-flung filaments. To the radio telescope, M 82 looks strikingly like the Crab Nebula, only some 100,000 times more powerful.

It seems undeniable, then, that certain galaxies are exploding. The energy involved is enormous, and beyond explanation at present: equivalent to a billion supernovae all going off together.

These explosions are evidently extremely short-lived events. They cannot be more than a few million years old, at the most, which is an eyeblink in the multi-billion-year lifespans of the galaxies.

What causes a galaxy to explode?

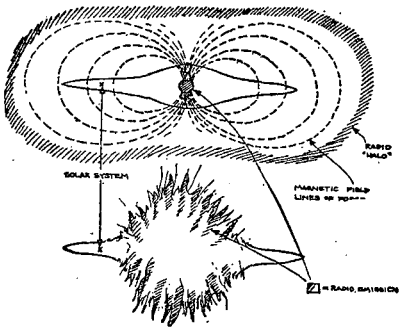

Fig. 5.
Comparison of Milky Way as it exists today, and as it might have looked during a galactic explosion. Note how galaxy's field lines "guide" exploding gases away from solar system.

Will it happen to our Milky Way? If it does, how will it effect life on Earth?

There are two main camps of opinion on the causes of galactic explosions. And "opinion" is the right word; neither side has enough evidence to make a solid theoretical case — yet.

Some astronomers feel that the explosions represent a sort of nova phase for a galaxy: a sign of instability and old age and eventual extinction. One variation of this idea is that in a very old galaxy, stars are clustered so thickly at the nucleus that eventually they set off a chain reaction of collisions and/or explosions of the supernova type. In a flash, the entire core of the galaxy explodes. Thus the tremendous energy of galactic explosions is

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assumed to be the nuclear energy of the stars themselves, as they explode together.

This "end-of-the-galaxy" outlook is opposed by other astronomers and cosmologists, who feel that we are witnessing the birth of galaxies, not their death. This view claims that quasars and galaxies like M 87 are in the early stages of condensing out of intergalactic gas. The energy source, then, is gravity, which causes an enormous collapse of gas in toward the center of the new-born galaxy. Here the gas is heated to such high temperatures that it expands outward again, explosively.

The "beginning-of-the-galaxy" concept looks slightly more attractive, at this very early stage of the debate. First, the quasars themselves must be quite young. After all, we are seeing them as they existed some six to ten billion years ago — which is roughly equivilant to the estimated age of our own Milky Way. Then too, M 82 is apparently a youthful galaxy, rich in interstellar gas and dust, which is a good indication of galactic youth. The Seyfert galaxies are mostly spirals, and comparatively young. M 87, although an elliptical galaxy, may also be very young.

If this "beginning" idea holds true, then the Milky Way may have undergone an explosion sometime in the past. Some astronomers feel this is exactly what has happened to our galaxy.

The Milky Way is surrounded by a very faint halo of week radio emission. Perhaps our galaxy suffered an explosion similar to that of M 82, and this "radio halo" comes from the feeble remains of the gases hurled out. This line of reasoning can be carried farther. The radio galaxies that we discussed earlier may also have undergone explosions in the past. The radio-emitting material outside these galaxies may also be gases ejected by the explosions.

If the Milky Way did explode, it could have happened in fairly recent times, astronomically speaking. Perhaps even after life had become established on Earth. If so, then our position in the galaxy saved us from serious harm. We saw in M 82 that the exploding gases expand along magnetic lines of force. These lines emanate from the galactic nucleus and loop around the galaxy. Along the central plane of the galaxy, the lines are perpendicular to the centerline. If the exploding gases follow magnetic force lines, they would find it much easier to loop up and around the galaxy, rather than bulling across field lines along the central plane of the galaxy.

The position of the solar system is close to the centerline of the galaxy, and about two-thirds of the way out from the nucleus — an ideal spot for maximum protection from explosions in the nucleus.

But will the Milky Way explode again? And if it does, will we escape unharmed? Only time will tell.

END

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DEM OF REDROCK SEVEN

by JOHN SUTHERLAND

Dem was no fool. You couldn't scare him with stories about intelligent, inimical humans!

The sun was a welder's torch cutting through the bleak, iron bowl of sky. Beneath, between the high-yield food flats of the Piedmont and the hostile sea, lay coastal barrens — an uninhabited jungle strip of trees and grass which stretched from Florida to the St. Lawrence.

Two portly, middle-aged Forestry fliegers—each in full greenplastic uniform—cast respectable middle-class shadows on the wilderness as they buzzed northward on routine radiation patrol. Along the Eastern Shore, across the cold wound of the Delaware estuary, up the Cape May peninsula they hummed, wings beating swiftly against a hot, humid wind.

Both trailed short pickup wires for the bulging, forest-green, transistorized radiation counters strapped beneath their mesothoraxes. Both watched conscientiously the tiny indicator dials strapped to their anterior legs. Now and again, when readings dropped dangerously low, they buzzed in circles like bluebottle flies over a garbage dump. Next, one or the other would speed his wings like a hornet-racer, dive, then roar at treetop level across the affected spot, spewing behind him clouds of radioactive cobalt dust to restore safe balance to the area.

Many years before, after radiation levels had dropped too low to inhibit dependably the growth of trees, the Agriculture Agency had ceased

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its attempts to cultivate the coastal strip. Now the Queen's Foresters checked and dusted only to prevent the multiplication of hostile life-forms. Inexplicably poisonous areas developed among the trees, and foresters sickened without apparent cause. Doctors confessed themselves baffled. All fliegers were advised to avoid the touch of trees and giant vegetables until the malady (popularly known as foresters' rot) could be indentified. The Queen's Research Council met daily with leading physicians. Dusting schedules were doubled, and minimum radiation standards were raised "significantly" (no one could find out exactly how much). But even worse things were to come—the first but not the least of them late that very afternoon.

For as one of the plump, uniformed fliegers swept low to dust a suspiciously low-count area near the confluence of Tom's River and Barnegat Bay, a thrust of sinister smoke rose to meet him. Seconds later the smoke column burst, hiding the unfortunate forester in a cloud of purplish dust.

The mysterious dust settled slowly, drifting south along the coast on the hot afternoon wind. The surviving forester circled the area at a cautiously respectful height, but his frantic eyes could discover no sign of life—nothing but an unbroken blanket of green hostile treetops. After buzzing and humming irresolutely for almost half an hour, he circled still higher, then streaked west toward district headquarters in the metropolis of Redrock Seven.

Next morning in the central offices of the Special Service (also in Redrock Seven) Dem Phlap's inflamed eyes winced at the dusty pile of papers on his broad blue polystyrene desk. Obviously no one had touched them since he had been called out the preceding month to cap the North Cape caper.

Just like the civil service, he thought. He leaned forward in his red nylon hammock, two anterior legs supporting his hangover-heavy head, a middle leg fumbling in his mesothorax pocket for his plastic-silver schtunkcase. He found it, and was canvassing other pockets for his starter, when a muffled thump bulged his translucent, circular office door.

"Come," he grunted.

The doorcover rolled back. Shy antennae flipped in, followed immediately by pert blue eyes, neatly rounded metathorax and all other necessary adjuncts to the nubile secretary.

In spite of his incandescent headache, Dem was impressed. "You're new," he grunted, his eyestalks bulging.

She watched him fumble for a moment, then picked up his desk-starter and snapped a hot squirt of catalyst into the end of his dry schtunk.

"Thanks," he said, puffing exhaust fumes at her. "I like my females efficient." He knew his reputation with the secretaries' pool—Blood and Sex Phlap they called him. He couldn't blame her for trying to make an impression.

"It's a number one buzz," she

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told him quickly, "and you're for it. The Boss wants you in his office right away." Then her eyes fell, her antennae quivered self-consciously, and she smoothed with trembling legs the green silk patch which covered the front of her long, softly rounded abdomen.

"Lead on," said Dem.

They buzzed slowly down the long, curving corridor, past other offices and other secretaries, to the pneumatic tubes. Once Dem's antennae brushed the tender tip of her abdomen, and he grinned to watch her bob and quiver. However, he dared not probe more boldly for fear she might be partially premutant and still harbor a concealed stinger.

The airblast in the uptube tumbled them together, and he took unfair advantage of it. When he helped her out on the upper level, he kept his wings poised ready to dodge.

Respectable females weren't supposed to like such games. But he'd been in rough company at North Cape, low company the night before, and didn't feel up to changing his habits. He grinned his challenge, and the young flieger surprised him by grinning back—red mandibles parted, green-gold antennae curled down around her oval blue eyes.

Dem was charmed. "What's your name?" he asked.

"Kwileen Maz," she lisped softly.

They perched side by side on the threshold of the Boss's outer office. "See you, Kril," said Dem suddenly, then hopped inside to face the knowing eyes of old Zascha.

"Still robbing the new hatches," she said, looking up.

"Fresh flowers yield sweetest nectar," he replied tritely. "I'm still sipping around." He leaned forward, puffed schtunk fumes, and whispered: "But I've nothing on for tonight, honeyblossom, if you'd . . ."

"Get before I swat," Zascha interrupted. "Right away the Boss wants you!" One middle leg stabbed a concealed lever and the inner door rolled back. Then she turned back to her multiwriter which, as he passed behind her, resumed its brisk, efficient ticking.

Dem's manner became abruptly sober and respectful as he buzzed to a landing in the inner office. For he knew that the portly, middle-aged, seemingly mild-mannered flieger at the center of the great green circular desk had antennae which reached to every potential hotspot on the planet. Known only as "the Boss" to over a thousand highly trained operatives, he had but to flick a lever on the instrument panel beside his modest desk-hammock to arrange a rescue in Ganges Ten, prevent an assassination in Weald Four, or raise a small army of fanatically loyal agents in the great capital city of the Urqueen, Timbuctoo Two.

"Sit, Dem," said the Boss softly, "and tell me what you know about humans."

Dem lowered his lean, athletic frame into a hammock, looked with embarrassment at the fuming schtunk which he still held coiled in the feelers of an anterior leg, then peered hastily about for a suction outlet.

The Boss smiled. "In the leg of the

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hammock-frame, Dem, when you're finished. But don't hurry. I like the smell."

Dem proffered his case. "Try one," he urged. "A private blend. I have a little shop in Bosphorus Seventeen put them up for me."

"Thanks very much, no. Doctor's orders."

Dem recalled elusive rumors that the Boss had been touched with winter blight. He hadn't wanted to believe them, for though agents died violently and often, the Boss seemed to live on and on. To believe in the Boss's invulnerability had brought a cheerful ray of self-deception into the dark maze of Dem's existence. But now as he looked closely, he could see the Boss's cheekplates were withered and sunk, his clear green skin tinged with sinister purple. "Sorry," he said. Then, grimly: "I just know the ordinary things about humans. Primitive sea mammals, inferior to dolphins in intelligence and agility. Sometimes they nest and swarm on land. But I've been hunting bigger game, you know. They're Agriculture's business."

"Agriculture and Forestry," the Boss corrected him. "The two agencies are supposed to work together on vermin control."

"Yeah," Dem grunted. He knew how much government agencies liked to cooperate.

Languidly the Boss flapped his anterior extensors, as if trying to fan away the fogs of digression. "But Dem," he intoned, "you must have heard of the high human civilizations which rose and fell in the black abyss of pre-history. Why, flieger-hatches for countless generations have passed along secretly those grand, occult legends!"

—And booby-hatches have been filled with the drones who believed them, Dem thought in disgust. Such romantic fables about human beings dominating Earth long before the rise of fliegerkind not only were Queen's Church heresy (which didn't much trouble Dem) but also were outrageous insults to the pride and common sense of every green-blooded flieger!

But the Boss went on speaking in low, firm tones which—in spite of Dem's suspicions—compelled respectful attention: "You have heard that another forester was killed yesterday?"

"Yeah." Dem vaguely recalled headlines glimpsed on the way to the office: "MYSTERY MIST FELLS FORESTER" and "PURPLE DEATH STRIKES AGAIN."

"The Special Service," the Boss continued portentously, "has been entrusted by Her Majesty's Research Council with a most delicate and most secret mission. What I tell you next, you are to repeat to no one . . . ."

Then he buzzed dryly on and on. It was some time before Dem could make much sense of all his big words.

First the Boss spoke of the Queen's Church doctrine of *Genesis Spontaniensis* (which held that the two great progenitors of all fliegerkind had sprung spontaneously from the Red Rock of their paternal mountain). Then he talked about a variety of Church myths: about the

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lifegiving Flowers of Flame which were supposed to have bloomed so suddenly in the sacred Garden of the ancient world; about the Enemy who fled, supposedly from the aroma of the flowers, to die most deservedly in the sea; about the Easter Eggs, with their mysterious promise of Eternal Life; and about the Golden Grail (or Saucer) in which the Life-Force had descended from the Pole Star.

The Boss spoke slowly and emphatically; time dithered on. Dem finished one schtunk and started another.

As he slumped dazed beneath a mandala of exhaust fumes, he vaguely gathered that the Boss had been cooperating with the Research Council in an investigation of these and other legends, and that they had found plenty of solid evidence of prehistoric human civilizations. Also he gathered that the mythic, diabolic Enemy might be nothing other than an euhemerized mankind. Reputable scholars, he learned, no longer paid more than lip-service to the *Genesis Spontaniensis* doctrine. Instead, they divided their allegiances between the Mutational Hypothesis (that fliegers had evolved from tiny, insect-like forebears who once had competed with humans for the dominion of Earth); and the Extra-Terrestrial Hypothesis (that fliegers had migrated to Earth from one of the planets which revolves around Sirius).

Dem's hangover grew worse and worse. He felt as if one of the midget fliegers from the first hypothesis was excavating the roots of his eyestalks with cold chisel and mallet. As for the hypotheses themselves — he couldn't have cared less.

"You are singularly unresponsive, Phlap!" the Boss exclaimed suddenly. "Now, what would you say if you were told that a new breed of humans seems to be evolving right now — a breed which actually may represent a throwback to the higher humans of pre-history? What if the hostile humans now burrowing like rats in our riverbanks should be developing self-conscious intelligences of a flieger, or near-flieger, level?"

Dem's rugged features twisted into an automatic smile. "I've heard some queer tales about humans," he admitted sleepily. "But old drones sometimes get a surrogate sex charge out of frightening each other." Then he swallowed and turned pale as he realized that the Boss might take his remark personally.

The Boss sat up straight in his hammock. "Old drones may carry deadly stingers," he quoted sententiously. Briskly he twirled papers on his desk, selected a fat red folder and pushed it toward Dem. "Study it," he snapped. "It contains evidence to date together with your sealed orders, Double-X Four."

Called by official number, Dem flipped his schtunkstump into the suction outlet and snapped to attention. "Yes, sir!"

"You are permitted one hour to read all papers," the Boss continued. "Read, memorize and destroy. You will then report to Forestry Depot

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#791 here in Redrock Seven where you will receive a special issue of radioactive dust bombs. Follow orders, handle the bombs with care — and you may return alive. Good hunting!" He extended a drooping middle leg.

Dem grasped it, suppressing a grimace of amusement and disgust. *Humans* indeed! And the old drone seemed to have been reading Purist propaganda about the dangers of excessive exposure to radioactivity. The mystery of foresters' rot had started a pack of silly rumors! Everyone knew that high radiation levels really were necessary to preserve the balance of nature. But Dem knew also what it cost the Boss psychologically to lend a top agent to another service. "Why can't they handle it themselves, sir?" he ventured.

"Read the report," the Boss grunted. "Keep us informed. Call for help when you need it. Zascha will arrange liaison." He turned to another stack of papers. "And close the door behind you," he added.

"Yes, sir."

In the outer office, Dem told Zascha. "Off to the wars again, and I'm to have liaison this time. Troops on call."

"I know," Zascha replied placidly. "But watch you don't just disappear like all the others."

"What's that?"

"Classified information. Read your own guidebook."

"Right. And have young Krileen Maz stand by for signals. I need a sympathetic connector."

"I knew you'd want her," Zascha spoke quickly, with a gray smile. "She's already got her orders. She'll stand by the flashbox in your office. But don't you dare frustrate her! Remember how young and innocent she is."

"Right again as usual, honeyblossom," Dem replied, practicing his best satanic leer. "That's the way I like them. But now I've got a little reading to do. Please excuse." And off he buzzed.

Three hours later Dem crossed the Appalachians fast and low, his four wings buzzing like chainsaws. His hot red eyes were lasers, burning humid air beneath an oblivious sun. Under his broad, green-burnished prothorax were two sleek metaluminum bombcases, each gripped firmly by a multipointed anterior leg.

The bombs were special emergency issue, loaded with high-count radioactive cobalt dust which was electrostatically charged to cling to moist human flesh. Dem carried them with distaste, for he put far more faith in the efficiency of the fifty calibre automatic heatblaster which nestled in a hidden holster under his metathorax cover. Years before, an old-style plastics modeller on a back street in Damascus Seventeen had handcrafted it for him. The well oiled, increasingly battered weapon had seen him around many a tight corner since those days of his initiation into the Special Service. However, it hardly seemed the proper tool for pest eradication.

Now, as he roared along, work parties far below waved lazy anten-

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nae from the food flats. They were harvesting either pigweed or milkweed — he flashed over too quickly to tell which. Next, the coastal barrens lay green and grim beneath him. Dem backed two wings to slow abruptly, then flung his lean gymnast's body into a full hornet-roll as he wheeled northward to begin his perilous search.

His wings buzzed slowly, almost silently, as he quartered back and forth across the hostile barrens. Gradually he worked into the Tom's River area, his burning eyes searching for fresh earth, felled trees, purple smoke or any other telltales of an infestation of humans.

As he approached the river, he descended to treetop level. Buzzing like a giant dragonfly, he dodged around and over thickets of scrub pine and oak. When he glimpsed that for which he searched, he paused only to confirm identification — then turned and retreated silently for about a quarter of a mile to a small clearing which he had scouted before. There he landed, lean legs into tall rough grass, metathorax deep amongst narrow sharp leaves and grain stalks which sprang spontaneously from the worthless, low-radiation soil, crowding out all succulent edible greens.

At the edge of the clearing he concealed the two radioactive bombs in a rank clump of rhododendrons. Like Easter eggs in ancient legend, these metaluminum spheroids might burst to bring resurrection and new life to the sterile, grass-choked land. But now they lay dormant while Dem flew to attach a thin metal filament, limp and adhesive as a strand of spiderweb, to the top branch of a short, twisted oak. Dropping to the ground again, he snapped the reel with the other end of filament onto the specially enlarged buckle of the secret, long-range flashbelt which all grade double-X operatives were required to wear.

He punched a concealed switch with the extensor of his right middle leg, hunched his left prothorax shoulder, then muttered into his collar-button mike: "XX4 to XXX, XX4 to XXX, are you there, Krileen?"

There was no reply. He called again, banged his flashbelt, listened, banged, called, listened, banged, called, listened, banged . . . Fifteen minutes later, the voice he longed to hear lisped from his earphone: "Yeth, Dem, yeth! Are you there? How ekthiting!"

"And where have you been?" Dem growled.

She told him at length, and also told him what she heard there, until he broke in: "Of course his wife doesn't mind! She knows he has to amuse himself somehow during the lunch hour."

But Krileen's shrill lisp picked up and continued without a break until Dem interrupted again: "Who cares about the Boss and old Zascha? Anything goes since the Great Sex Mutations. You wait — I'll show you something once I've capped this caper."

"Ooh, Dem!" she squealed. "And will you take me out to dinner, too?"

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"Dinner, too," he promised, "but first business. Now tell me, did the autopsy report come in yet on that Forestry stiff they recovered this morning?"

"Now let me thee. Yeth, I believe thith ith it — but it'th awful nathty!"

"Well, read it anyway," he grunted, getting out a fat notebook and turning to a blank page.

Later — after the red-gold disc of sun had plunged into the slot machine of night, and the stars had switched on one by one as if nudged by celestial pinballs — Dem lay under a hawthorn bush watching the entrance to a crude log hut.

The hut stood in a clearing within twenty yards of the south bank of Tom's River. Dem lay in a patch of thistles, his head and Anterior legs so entangled in a low, twisted branch of the long-spined hawthorn that he couldn't move without adding fresh punctures and scratches to those from which he already was suffering.

Clasped in the bloody feelers of a middle leg, Dem held the tattered neck of a large paper sack which once had contained his lunch. Now it was stuffed with radioactive cobalt dust which he had dumped from one of the Forestry Service bombs. Like his own torn body, the sack had been pronged many times by the thornbush. More high-radiation dust clung to Dem's skin and clothing, and hung in the air around him, than he cared to think about — however much be scorned the trepidations of the Purists.

The dust made his mouth and eyes twitch and flicker in silent, involuntary occlusions. He longed for a wet, fuming schtunk to clear his polluted membrances. However, he dared not venture it for fear of being discovered by the small, furry, two-legged mammals who were marching so purposefully to and fro — from hut to water, from water to hut. Some carried burdens and some did not — like so many beavers or packrats, Dem thought scornfully.

But he knew they must be the deadly human animals of which he had heard so many lurid tales.

As he watched in fascination the dim, furry forms streaming back and forth like automatons across the starlit clearing, he found it almost impossible to believe that such lumpish creatures could have developed selfconscious intelligences. As for the autopsy report on the Forestry type — to suppose that these animals could have synthesized a complex poison of the sort which was supposed to have killed him seemed outrageous fantasy. He'd sooner believe that the flieger had himself secreted the poison in one of the overstuffed, septic organs of his great, bourgeois, blimplike body.

Yet he knew the autopsy could not be disregarded. Special Service analysts — they said — never made mistakes. And the elaborate findings in the other reports he had read and burned had been purchased with the Service's lifeblood. One double-O and two single-X operatives had died to advance the Service's banner, as it were, to the brink of battle.

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Now he — XX4 — was carrying the flag, and he had unlimited reserves on call. The honor of the Special Service was at stake. The Boss was out for revenge. Blood must flow. And in this hour of emergency, all he — XX4 — could find for opposition was a line of scuttling, stinking, little furry animals.

Dem writhed on his bed of thorns. At least, he thought, he could bleed personally for the cause. Bleed — and wait his chance!

Dem's plans were simple enough — although they depended too much on other fliegers' hypotheses for his liking. He watched and waited until the humans stopped beavering back and forth. Most of them, as far as he could tell, finally stopped in or under the river — wherever they came from.

Cautiously he moved a middle leg, then winced as long thorns tore into his flesh. Gritting his mandibles, he moved again.

Black clouds smothered the stars one by one. Still, humid air weighed Dem down, held him back, as darkness became total. However, for over two hours his trained micrometer eyes had measured the ground before him. Now, like rat to foodgate in a psychologist's maze, he crawled slowly but unerringly toward the doorway of the rude hut.

Far to the west, heat lightning flushed the sky. A distant soughing of wind in wild treebranches sent a chill quivering down his soft, vulnerable abdomen. The terror grew: trees; humans; and that soft purple dust which had felled the Forester — an incredibly sophisticated synthetic poison, mortally toxic only to invertebrates!

If the human animals really had produced such a fiendish weapon, all the civilized world — life itself as Dem knew it — was in jeopardy. All scornful thoughts of pest control now far behind him, Dem's heart swelled with pride that the Boss had selected him for so great — so critical a mission.

(An unrepressed spark of self knowledge in the back room of Dem's ego perceived these emotions with objectivity — then called frantically for another drink. Fear and pride were the chief moving passions of the Special Service, were openly worshipped as the Holy Carapace of all military services; but in every other fliegerly tradition they were held to be extreme symptoms of neurosis. Fear was the most ignoble; pride the most noble; but both were prime symptoms of the great Fall from Sanity which was the backbone of Queen's Church theology. — The drink came, and the spark hurriedly extinguished itself therein.)

Silently, on anterior and posterior legs, Dem crept through the invisible door opening. The feelers of one middle leg still grasped his tattered sack of radioactive dust. The feelers of the other were grimly clamped around butt and trigger of his 50 calibre Damascus-plastic heatblaster.

Although he could see nothing, he could sense the oppression of thick walls which now cut him off from outer air. The ceiling was so low that he had to stoop, and the

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atmosphere was thick with musk which Dem knew must come from human scent glands — but there was also a biting, penetrating aroma which seemed to cut like a razor into all his soft papillaries and nerve-ends. Painfully he waited in the black, poisonous air, straining for the sound of crude respiration, or any other evidence that an animal had been left on guard.

When no noise came, he started swiftly to work.

First, with hooded flash, he examined cautiously the boxes and barrels stacked around the walls of rude enclosure. They were all open. A skilled roll of his trained eyes — like yo-yos bobbling behind the steady sweep of his flashbeam — revealed that the boxes contained sealskin boots and cloaks, shark-skin breeches, rough bronze tools and cooking utensils, slabs of putrescent fishmeat, swords and spears of bronze and other primitive artifacts.

Clearly, Dem thought, the humans were projecting a dangerously elaborate settlement on dry land. Equally clearly, their culture — although surprisingly advanced — was not up to the synthesizing of fiendish insecticedes.

Nonetheless the presence of two mysterious barrels in the right rear corner of the cabin was painfully apparent. The barrels were molded of a strange black plastic, and each was over half full of that strong-scented purple powder which was causing Dem such agonies of body and imagination — as he recalled all the nauseating symptoms of foresters' rot.

Gingerly, like a suburban householder investigating a clogged septic tank, Dem prodded with averted head into each powder barrel. He had thought of disarming the humans by making off with their poison, but this was clearly unsafe for him to attempt. At length he contented himself with pouring radioactive cobalt dust into each barrel, as well as into the open boxes of food, clothing, and utensils. Tit for tat, he thought grimly — humanicide for insecticide. The brutes deserved no mercy; let them be hoist on their own stingers!

The fetid air of the hut was now doubly charged with poison dust, and Dem started toward the door as eager for fresh air as if he'd been fumigating the community outhouse.

But before he could escape, he was stopped by a flare in the clearing. He ducked behind a box of swords and spears, then peered cautiously out to watch with dismay as a cluster of humans piled sticks on a rapidly growing bonfire.

Lightning flashed and thunder rumbled in the distance as the flames mounted higher. More and more humans gathered about the fire. Dem writhed in chemical torment in his enforced retreat, and wondered if he dared make a dash for the forest. Then he ducked further back as an uncouth, naked male lurched over to sit on a log about two yards in front of the hut door. The creature leaned back, stretched its legs, and took a great swig from a half-empty skin bottle dangling from one muscular paw. Dem noted with complete disinterest that humans were not

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furry, as at first he had thought, but were covered with thin patchy hair like mangy harbor seals. He also noted — as a familiar musky reek assaulted his aching senses — that they stunk even worse than he had thought.

The firelight filled the clearing and streamed through the low open doorway of the storage hut. It danced in shimmering flashes from the assorted bronze cutlery behind which Dem lay low, and its reflections danced a superfluous ballet upon the rough ceiling. Humans wandered in small groups, swigging from bowls and flasks. Two seated by the fire began rhythmically beating a set of deeply resonant drums. Others took up a guttural, cadenced howl — which might be a song, Dem realized, to human ears. The humans' hair was varicolored — black, brown, red, yellow, gray, white. Their skin color was obscured by darkness and matted hair, but seemed to be some dirty shade of gray or tan. Dem could see no cool fliegerly greens or blues to relieve the pervading brutality of the scene.

At first all humans looked alike to Dem, but after watching the animals for a while he found it quite possible to distinguish between the sexes. The females were easier to identify, since they seemed generally shorter, softer and heavier than the males. Some females' faces looked shockingly fliegerish without the thick matted beards which distinguished the mature males; most females seemed to have protuberant or pendulous mammaries (growing, interestingly enough, only on the upper halves of their torsos); all the females seemed to lack external genitals (in contrast to the males, whose vulnerable organs were indecently obvious). How nasty and unfliegerly humans were in every important particular, Dem thought in wonder and conceit.

Meanwhile the celebration grew more and more orgiastic. Males and females drank together and shuffled together in rude, snakelike lines and circles to the monotonous beat of drums. Dem squirmed on the hut floor, excited by the creatures' barnyard antics in spite of his very proper disgust. But as he squirmed, he thought with growing fear and pain of the mixed poison dusts which were being ground into his every aching pore.

The debauch lasted all night. The lightning storm which Dem had been watching hopefully passed over and went out to sea without interrupting any of the humans' violent antics. In fact, the brief rainsqualls and close lightning flashes which accompanied it only served to stimulate acrobatic dancing on the part of some of the younger creatures.

As Dem watched for a chance to escape, indefatigable dancers piled more logs on the fire. Dem settled down to watch, his mood fluttering in near panic between fascinated disgust at the complex scene before him, and a heightened awareness of throbbing congestion and pain in his abdomen and posterior legs.

Next morning Dem started awake to blink at bright sunlight flooding the clearing. Pitilessly the transpar-

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ent golden element revealed crumpled knots of naked, sleeping animals littering the muddy grass around the burned-out fire. Dismayed at having fallen asleep himself, Dem crouched to make the dash for safety which might have succeeded easily an hour earlier.

But as he bent his trembling limbs to run, a raucous cry suddenly shook the clearing, and the brutish sleepers stirred.

Blinking and dazed, his head aching, Dem stared confusedly around at the chaotic scene. At the same instant, a troop of about twenty humans trotted briskly into view, carrying a thin, green-gold form bound and faintly fluttering in their midst. Dem stared horror-stricken at this tableau of beauty and the beasts.

It couldn't—shouldn't—be, but incredibly was—Krileen Maz!

Quickly she was hidden from view by a swarming crowd of awakened debauchees. But her quick, shrill cries — apparently of pain — cut through the slow gutteral human noises to strike horror like a hot iron into Dem's quaking soul.

Deliberately, with trembling limbs, he selected three swords from the box before him. He gripped one in the pincers at the end of each anterior leg, took another in the tactile extensors of his left middle leg, and released the safety switch on his heatblaster which still was gripped grimly by the extensors of his right middle leg.

Boldly then he stepped into the open at the rear of the milling mob of brutes.

Like an avenging angel he stretched himself to his full height of over eight feet, leveled his four weapons, spread his four wings, and buzzed furiously. The nearest humans stared, shook their aching heads in horror, and turned to flee. Dem cut them down pitilessly with his blaster. Then, to the music of screams and the incense of burning human flesh, he speeded the tempo of his vibrating wings and took off with a roar. Straight into the crowd he charged, flying just above the humans' heads and striking at them like a windmill with his three swords—for he dared not use his blaster against the main mob until he located Krileen.

The humans rallied. A lucky spear thrust pierced one anterior leg, and a sword dropped from its nerveless pincers. Other spears wounded him less seriously; a rock buffeted his head. Consciously he strained to rise out of danger, but growing weakness gnawed his vitals and he sank earthward instead. As he touched the ground, his cramped, poisoned posterior legs folded beneath him, and he crumpled in impotence like the wreck of a great airliner.

Then, mercifully, a crunching blow to the head blacked out his senses, and he could smell no more.

One week later, Dem, bandaged and pale after a painful stint in hospital, stopped at the S. S. offices in Redrock Seven to pick up Krileen Maz for their long projected date.

He watched sadly, remembering many other occasions, as the five o'clock tide of secretaries flowed through the outtubes. Presently a

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pert, svelte form detached itself from the mass and flew to meet him. *"Nur wer die Sehnscucht kennt, weisst was ich leide,"* he murmured.

"Ooh, Dem!". Krileen squealed. "What funny wordth. What do they mean?" She ran on without pausing: "Isn't it all too, too ekthiting! Let's have dinner first, pwitty please?" She fluttered her eyelashes and blushed.

As they sat hunched over cocktails in a crowded restaurant, Dem expressed his gratitude for Kril's presence of mind in telling the Emergency Squad to follow close behind when she started out so rashly to search for him. In return, she described to him the dramatic scene through which he had continued so mercifully unconscious.

The two of them had been bound together to an upright pole. Flames had mounted around them. Savage hands had piled on more wood. She had screamed—then out of the west rescue had arrived, on the golden-green wings of a fighting squad.

Automatic heatblasters and aerosol bombs had made short work of the humans. Only a pincerful had escaped to their underwater burrows. The storage shed had been destroyed, and the barrels of purple insecticide had been carried back to Redrock Seven for analysis.

"I know," said Dem. "The Boss told me that the powder was of unknown origin. But our chemists believe that it must be ancient—that it probably was compounded by prehistoric humans in some otherwise totally unrecorded high civilization. It may have been made as ammunition for a war between prehistoric humans and our own pre-mutation ancestors—no one knows. One thing only is sure: those human animals we tangled with couldn't possibly have made the powder. They merely found it and used it. Why, they shot it up at those silly foresters with the most primitive catapults!"

"Then you've thaved uth all!"

"I guess we're pretty safe now," Dem agreed, his chest swelling a little. "Possibly the humans may find some more powder, but they can't make any more. They must have come on it just by accident while excavating one of their burrows. Who knows what archeological wonders may lie beneath that damned coastal jungle!"

When they had finished dinner, Kril fluttered her eyelashes at him again. "You remember how we were talking?" she asked.

"Yes."

"Oo were going to show little me thomething new?" she simpered.

Dem gathered his nerve. "The doctors say," he began . . .

"Yeth?"

"The purple itch—I mean the purple powder—well, it's caused surexcitation of the occlusors, if you know what I mean . . ."

"No?"

"No," he concluded lamely. "The necessary zones are all weeviled out. They won't be right for a month."

"Ooh, poor Dem," said Krileen blandly, looking down at her menu. "Can we have some more bwandy and another dessert, instead? I hoped you'd show me thompthing thpecially nice, but perthonally I've always preferred eating." END

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BOGEYMEN

by DICK MOORE

Illustrated by GAUGHAN

There are two kinds of duty in space warfare—the dull and the deadly!

I

The dreariest duty in space, Silky Thornton often thought, was standing the breakfast watch. He liked most things about life in the Atlantic Power Space Fleet, but between four and eight o'clock in the morning his amiability and efficiency always seemed to hit bottom. On the bridge of the little corvette *Gedrosia* the only luxury available was ship's coffee, and it didn't seem to be the whole answer to his problem. It was usually strong enough to revive a corpse — or at any rate to keep a corpse standing at attention until dismissed — but it had no cheer in it somehow. Still, it was the only company he had since the helmsman was a computer.

The clock beeped ting-ting, ting-ting. Four bells, 0600 hours.

Silky sighed, put down his coffee, and made a routine entry in the log. He was a tall young man in the neat blue G-suit of the Atlantic Fleet, whose gunnery officer tabs did not

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quite jibe with the non-regulation coppery beard, the somewhat absent expression, or the restless air of having been somehow mislaid by fate.

He leaned back again, tossed his feet up on the plotting table, and resumed sucking at his third cupful of what tasted like liquefied coal. He gazed blankly at a panel of meters, which gazed blankly back. Not that his mind was by any means off the job, but just now its programming was a little shaky. His intellectual processes had the distressing habit of getting up half an hour ahead of the rest of his brain and running wild until he was able to focus his eyes and button his shirt straight.

Even now, after two hours on watch and a pint and a half of lightly diluted caffeine, his undisciplined cerebrum was free-wheeling in two directions at once. One hemisphere was soberly engaged in reckoning up the last hour's mileage. The other was gaily comparing the effectiveness of various rhymes for "necrolatromaniac", to ornament a scatological ode on the poor overworked hindquarters up at headquarters. A tender subject, perhaps . . .

Silky yawned once more. For nearly a year, ever since he had boarded, the *Gedrosia* had been sheepdogging, beating back and forth along the changing pathway from Luna to Mars listening for distress calls. Not one had been logged. The *Gedrosia* spoke to several ships a day, but they always responded with monotonous good cheer. The only element of variety was the length of the crossing, which increased gradually from forty-two hours minimum to five days maximum as the planets drew apart along their orbits. In three weeks more the ship would dock on Luna for a routine overhaul and Silky would get a fortnight's shore leave. But that was still a long, dismal way off. Right now it was two and a half hours since waking and still two hours to go until breakfast —

At that moment Lieutenant Harrod strode through the door.

His manner seemed to portend orders. Silky unclutched the coffee cup and bounced up to attention. The skipper was darkly handsome, darkly silent, with a gunbarrel eye and the face of a captain of cadets on a recruiting poster. Somehow, he generally made Silky feel like a cloddish rookie impersonating an officer.

"Mr. Thornton." (Not too promising. When things were normal the skipper usually called him "Guns".) "Have you picked up any unidentified craft on the detectors this morning?"

"No sir." Silky slewed a covert eye toward the magnar tapes. They showed each a slim trace, nervous from solar static but nearly straight. No ship had passed within a hundred thousand kilometers, then, since four A.M. "Nothing at all."

Harrod gazed at Silky noncommittally for a moment. He had never found any reason so far to fault the young gunnery officer on discipline or technical competence, yet

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Silky left him feeling uneasy. That restlessness, those silences, the spasms of wild quippishness, that not-quite-unallowable beard, all kept him wondering whether the boy were — what should one say? — *solid* enough, spaceman enough, to be counted on if things should ever get nasty.

"Mr. Thornton, I'm about to sound the general alert. In five minutes there will be a meeting of all ship's officers in the wardroom. You will be relieved here and attend."

"Aye aye sir."

Harrod wheeled and vanished into the signal cabin. Almost instantly the PA system began hooting the general alert. After a few seconds Harrod's voice put a period to it.

"Now hear this. Now hear this. Attention all hands, this is the skipper speaking."

A little pretentious, Silky thought, for a ship holding exactly twenty men who lived practically in one another's laps. But he suspected privately that the skipper would address a crew of one in exactly the same style.

"According to a signal just received from Fleet Headquarters, a force of more than forty ships strong has just left the Pacific Powers' base on the planetoid Hidalgo, ostensibly to hold maneuvers. Fleet Intelligence suspects that they may intend to make some attempt against our base on Phobos, the inner moon of Mars. We have been ordered to find and watch them until units of the Atlantic Fleet can assemble in sufficient strength to prevent any undesirable incidents. In thirty minutes we will go on emergency speed and begin a search. Secure at once for action. That is all."

As the hum of the speakers stopped the corvette came audibly to life. Orders reverberated, bells rang, signals buzzed, feet hurried, unseen machinery clacked and whined and muttered. Silky made a final entry in the log and chuggalugged the rest of his coffee. A smile was beginning to dawn inside him; soon it became apparent on his face.

This, at last, was what he had joined the Fleet for! It was definitely high time, he thought, that the log should have something more stirring to display than, "S-3/c Jackson scalded by hot soup, temporarily relieved from duty."

Chief Petty Officer Coker pushed his heavy shoulders through the doorway and saluted, traces of his bolted breakfast still caught in his mustache. "Mr. Thornton, I'm to relieve you on watch, sir, skipper's personal orders, and you're to report to the officers' wardroom."

Silky tossed back a salute. "Take over, Chief. Course steady, screens blank, solar static boiling up a little and may get worse."

He ducked out the door, slid down a pole that paralleled the companion ladder, and entered the wardroom. All the other juniors were there before him: Engineer Officer Haig, long, tough and imperturbable; Signal Officer Wykerman, short, swift, body and mind focused in two hot blue eyes; Astrogator Richey, round shouldered

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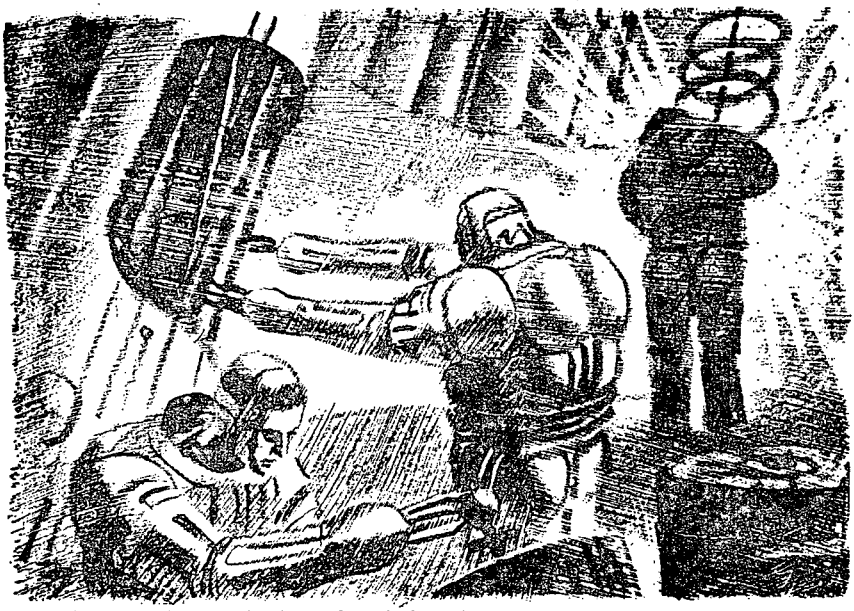

and hound dog sad; huge-handed Black Jack Gardoni and first mate with his eternal cigar. Silky slipped into a vacant seat at the table, and the next moment Lieutenant Harrod stepped in and closed the door.

For a few seconds he stood at the head of the table, scanning the men's faces. Then he seated himself and looked down at the message tape in his hand.

"Gentlemen. I presume you all realize that our problem is political as well as tactical. We are being sent to prevent a disturbance, not to create one. We have to bear in mind that this is, first of all, the Century of Peace."

A small sour smile flitted round the table. Perfectly true, there had not been a declared or acknowledged war since the beginning of the century. By a polite fiction honored on all sides, the great game of Go, played by all the powers with the solar system for a game board, was pure political negotiations.

There were certain things it was considered bad manners to notice. A vanished ship. A missing reconnaissance force. Wreckage on the sands. Bodies sent home after "fatal accidents" that left little round holes in them. Space maneuvers during which the incidence of "meteorite damage" was abnormally high. Ground defense drills with live missiles, exploding fiercely in a sky officially empty. For all these things there were logical explanations that hurt no feelings. "Bilateral adjustments" was the popular term. Meanwhile the *Gedrosia* carried thirty-two nuclear torpedoes. Live.

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Having made his salute to the fictions men live and let live by, Lieutenant Harrod got down to facts.

"Now for our tactical problem. A possibly unfriendly force left Hidalgo four hours ago and now is thought to be on a course toward Mars. We assume they are proceeding at high acceleration, perhaps five gravities. If so, by this time they will be making more than seven hundred kiloms per sec. Our own speed at the moment is four hundred eighty-two KPS, and we are far off their line of flight, which puts us under difficulties that only maximum acceleration and expert maneuvering can overcome.

"But computing the necessary maneuvers and carrying them out is a fairly routine matter. Our real handicap just now, as you all realize, is the short range of our detectors. Our radar has a maximum range of fifty thousand kiloms, which Mr. Wykerman tells me is reduced to about forty thousand right now by solar static. Our magnar can pick up the other people's ion trails at perhaps triple that distance, due to their numbers and high acceleration — again, if the static doesn't blur it out. Since our information is so sketchy and our horizon so small, our search has to depend essentially on educated guesswork. We must manage to come within a hundred and fifty thousand kiloms of the other people, at a distance where we can see them but they can't see us, and we have to find them before they come too close to their destination.

"Therefore we must make up our minds quickly. By the time we can decide on their most probable course and reach it, they may be within two or three hours' flight of Mars. That may be long enough for us to call in help, but it certainly leaves no leeway. As far as I know, we are the only Fleet unit in this neighborhood free to conduct a search at this moment. Of course, it's in case of just such emergencies that so much of the Fleet is always scattered across the solar system playing traffic cop."

He turned to Wykerman. "Signals, what can we do to extend the range of our detectors?"

Wykerman's eyes were blue pinfires of concentration. "Well, sir, we could try something I heard was done on maneuvers once. Rig some guided missiles as magnar carriers and run them out ahead or abeam until their search fields just overlap the ship's. That would nearly triple our range in certain directions. We haven't got enough repeater sets aboard to cover *all* directions. We could fill in some of the gaps, though, by setting the missiles to orbit the ship in a programmed pattern."

"Good. Rig and set out as many as you can. Guns, rout out your men and give him all the help he needs."

"Aye aye sir."

"Stars," Lieutenant Harrod swung to Richey, "since we haven't time to drag the whole sky looking for the other people, we'll have to try analyzing their probable intentions, and see what sort of action that indi-

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cates. Afterwards, with luck, we'll be able to take up station and lie-to near their flight path, waiting for them to show up. Now: you, Stars, are the pacific astrogator. What course do you lay?"

Richey chewed his heavy lip. "Well, sir, that would depend on the skipper's choice of tactics, I guess. I could go barreling straight in and hang the risks. Or I could bend to the east a bit to avoid being spotted by the weather station on Iris. Or I could swerve out in any direction, even zigzag, and come back to the target after wasting a few hours. At five G's I could get a whole million kiloms off my true course and back on it again without losing more than five or six hours. Or I could even loop wide around Mars and come in from the rear."

"But if your target is already known — or guessed —" objected Harrod, "most of those courses only waste time that should be used in getting there before the defense does. For safety's sake I think we will just have to assume that they mean to hit us as quickly as they can. They must be fairly sure that our agents have reported their departure and destination by now. If they really mean to strike, by far the wisest plan would be to strike before any adequate defensive force can assemble."

"Then you want me to lay them a course straight from Hidalgo to Phobos, sir?"

"I believe that's the most reasonable. Right now I don't think there's anything on or above Mars powerful enough to stand off forty warships, except possibly Phobos base itself. In my opinion the other people's best chance is to bulldoze right in. So get a blank chart and plot me their course on that assumption."

Richey pulled out of his jacket a crumpled sheaf of blank space charts. Rapidly, from memory, he pencilled in Earth, Luna, Mars and Hidalgo on the polar coordinates. He X'd in the *Gedrosia's* last computed position, with a numbered arrow for course and speed. Then he ruled a line from Hidalgo to the orbit of Mars, replaced it with a slight curve to allow for solar gravity, and began dotting its length with little beads, the hypothetical hourly positions of the Hidalgo task force. "Are we aiming for interception, sir?"

"Not just interception. Our orders are to find and watch. We have to swing more or less parallel with their course, preferably leading them a little, so that we can keep them in sight for a while. Closing at six-G, where can we best run them down?"

Richey sketched in the corners of the chart a little, consulted his slide rule, jotted numbers in blank spaces. Then he drew a small circle and threw down his pencil. "Somewhere about there, sir."

"Mmm — rather close to Mars. Doesn't give us much margin. But we can't afford to shoot for them farther out, where we'd cross their course at such an angle that we couldn't come about in time to follow them. Compute that course and

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feed it to the antopilot. Their report to me on the bridge. Who has this watch?"

"I do, sir," Silky recalled.

"You're relieved. You and your men are going to be helping Signals and his men rig as many missiles as possible for magnar. Run them out and keep them moving around the ship. We go to emergency speed in less than five minutes. Any further questions? Dismissed, gentlemen."

For the rest of the day Silky, Wykerman and their assistants were extremely busy, and extremely uncomfortable. While the *Gedrosia* tore along at six gravities' acceleration and the rest of the crew lay in G-couches, the gunners and signalmen had to work carefully and arduously. They all wore motorized suits, which added the strength of servomotors to their overburdened muscles and made movement possible. But no suit could relieve the tormenting weight of iron-heavy flesh and lead-heavy blood, or keep the brain clear when all the blood was trying to stay in the feet. The men worked slowly and rested often, groaning.

Of course there were accidents. Wires were broken and painfully respliced. Sixfold-heavy tools were dropped into fragile mechanisms. Men fell over things and things fell on men with bone-wrenching impact. A chain hoist bearing ran dry and froze under the sextupled weight of a two-ton missile. After some tricky work that got them nowhere, they had to request Lieutenant Harrod to throttle back the engines to half-G for one minute. In one-half normal gravity they were able to manhandle the huge deadly object into place on an inspection rack. Then the acceleration piled on again.

In five hours the six men managed to install six magnar repeaters and ruin two more in the effort. Then they decided to weld a girdle of fuel drums around each missile, brace them heavily, and connect them up as extra fuel tanks; otherwise the birds would run out of gas in about two hours. After this grafting operation the missiles could by no means be fitted into their launchers. It was necessary to launch them off the magnetic grapple normally used to haul them in after practice firing, which meant reinforcing the grapple gooseneck with steel hawsers and rigging a sheaf of starter cables from the firing mechanism.

They had to call for another throttling back of the ship's engines so that the torps could be launched without fouling or breaking loose, but at last all were out and away. The enlisted men could strip off their suits, collapse in their G-couches and try to catch their breaths. But Wykerman and Silky had to stay up until they had tested the radio and magnar circuits, positioned the drones at the points of a vast octahedron about two hundred and fifty thousand kilometers out from the ship, and set them to orbit around it automatically. After their report was on tape, Silky crawled into bed and sank into a stupor.

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When he woke, the ship was in free fall and the speakers were hooting the general alert.

Silky's training-ship reflexes awoke instantly. He whipped a fresh uniform out of the press, tucked it under one arm as he shot out the door, and launched himself up the ascending well — a little crookedly; for when he reached for the first handhold his back and shoulder were raked by a slash of pain that sternly reminded him he had lately been working under high-G. Indeed his muscles were so stiff, he found, that after the first convulsive response he could hardly bear to move. But he managed to get out of the shaft at Fire Control and bang down the on-deck signal button with one hand, shake out his creaseproof uniform with the other, hook his elbow round a stanchion and begin dressing while the clamor of general alert died away.

"Now hear this. Now hear this. Attention all hands, this is the skipper speaking.

"I believe that we are now in a position to intercept the force we are searching for. We will drift here, maintaining radio silence, and as soon as we detect the approach of the other people we will alert Phobos and Lacus Solis on Mars. We will remain here until help arrives. I want every man on the alert. I expect action within two hours. That is all."

The hum of the PA system went off and Silky's intercom rang.

"Fire Control, Thornton here."

"Harrod, bridge. Are all your detector missiles still on station?"

Silky glanced toward the magnar plot. "Yes sir, all six."

"I want you to position them out toward Hidalgo at extreme control range and cut their engines. How far away can you control them?"

"Hard to say just now, sir. As far as a tight ten-watt beam can cut through this static. Maybe a couple of million kiloms."

"One million will be satisfactory. How long will it take?"

"About an hour, sir. They're built to maneuver at a hundred G's, but those extra fuel tanks slow them down a good deal. And their superhot ion jets will make more magnetic noise than the whole blistered Hidalgo squadron."

"Then hurry! Have them in position and quiet before the other people arrive!"

"Aye aye sir."

A rocket capable of hundred-gravity acceleration, or even a decent fraction of it, makes remarkably little of a million kilometers. Silky had his six torpedoes positioned up the track in less time than he had predicted. Then he cut their engines, shut off the control beams, and reported.

The ship was now in radio blackout. Only the tight-beam transmitters in the torps remained on, sending back the magnetic echoes of an empty sky. Save for telescopes and magnar the *Gedrosia's* eyes, ears and mouth were shut; and she drifted.

Silky appreciated in full the risk they were taking. A fusion engine is not very big. *Gedrosia's* six en-

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gines went about eight tons apiece, exclusive of mountings. But to start them and wind them up to self-sustaining thrust required all the power from a bank of accumulators several dozen times that size. *Gedrosia's* midship half was packed solid with accumulators, yet these sufficed to start only two engines — just enough for blastoff from Earth. It took several hours of flight to recharge the banks so that two more engines could be started, and additional hours for the last two. At ground stations, of course, power was available to start all six engines one after the other. But by stopping dead out in mid-space, Harrod had in effect deliberately cut off one leg.

He had also placed himself in a bad position to fight. Every missile had to draw on those same accumulator banks to launch, aim and fire every gun. Even the briefest skirmish would run down their power reserves.

But on the plus side, the ship was now unrecognizable on any standard detector, indistinguishable from a meteoroid. Harrod had traded fighting power for invisibility. There did exist gadgets that would identify a mass of steel and alloys as such, but they were still short-ranged, cranky, and — in brief — not standard equipment. The *Gedrosia* had effectively vanished into the blackness.

But there matters hung, hour after hour. Harrod's original two-hour estimate stretched out and out in high-tension silence. The stars glittered. Mars shone brighter as they drifted steadily closer to it. The signal room picked up traffic chatter and the gibberish of coded spacegrams. Phobos Station was still there — and feeling no pain.

After six hours Harrod relaxed the general alert to "stand by" and called a new conference in the wardroom.

Around the table the men were watching with a sort of intent offhandedness, waiting for the first word from the skipper. Lieutenant Harrod took his own time before pronouncing them.

"Well — I guessed wrong."

The words drifted down through the silence and lit on the table, face up.

"Now. Gentlemen, we seem to have three main choices. One. We can return to Mars and report failure to make contact."

No response.

"Two. We can hang on here and wait until something happens."

No response.

"Three. We can go out and reconnoiter in the direction of Hidalgo."

A short uneasy motion. The silence was beginning to grow a little dank. Richey crushed out a cigarette and stared at the stub.

"I take it then, gentlemen, that you have no positive recommendations at this time."

First Mate Gardoni swiveled his cigar negatively. Chief Engineer Haig bunched his fingers as if gathering himself to say something, then relaxed.

"Well, gentlemen, maybe our little adventure is over. And we didn't

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get our names in the history books after all.

"But gentlemen, this is the first time that our ship has been ordered out on a tactical mission since she was launched, and I'm not taking her back to the sidewalk patrol until so commanded. We were ordered to find and watch the Hidalgo task force, and it's going to go into the log that we kept searching until called off by headquarters."

There was a slight but general brightening around the table.

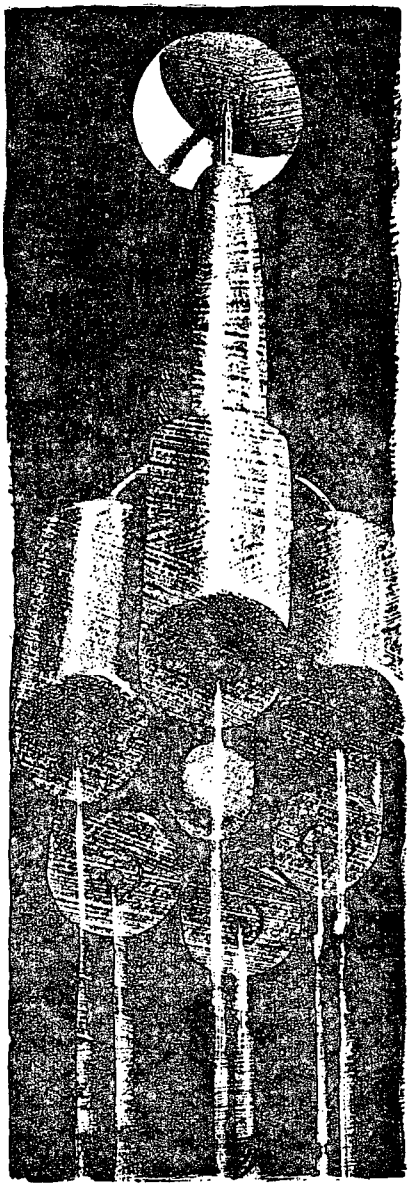
"Now. Tactics. The other people may, of course, have changed their objective and be heading at this moment for any target between Mercury and Titan. But we have specific orders to stand guard against an attack on Phobos. In any case, I doubt we could reach any other planet in time to do any good.

"So being here, I intend to stay here. Where the other people are, we have no way of knowing yet. But if they do come to Phobos they will most probably come past here. So until this business is settled or I receive orders to the contrary, I am going to maintain station here, a million and a half kilometers off Mars, and wait. Any further questions?

"By the way, Guns, just what do we have right now to amuse an unfriendly force with, in the event that we should need to — make a demonstration?"

"Sir, we have twenty-six nuclear missiles left, fused but not armed; one recon fighter with remote control circuits . . ."

Silky knew perfectly well that



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Harrod had used the term "amuse" in its technical military sense: to so distract an enemy with threats as to divert him from his objective and keep him from accomplishing anything useful. But Silky was no purist; he was a poet of sorts, practiced at combining a word's conflicting senses in a single metaphor. And "amuse" sparked a glitter of deviltry at the back of his mind.

". . . .one heavy laser battery and four light ones; four machine gun batteries; four rocket batteries; one hundred proximity mines. And, withal, our fascinating selves."

After the meeting broke up, Silky set to work on his own private project for "amusing the enemy". He proceeded to requisition, "for urgent repairs," two spray cans of fluorescent orange paint, a welding outfit, several hundred pounds of metal sheet and tubing, and six oxygen cylinders. Load by load he herded the stuff through the gravityless companionways to the "powder vault" where nuclear explosives were stored in cadmium foil. After donning a radiation-proof suit he locked himself in the vault.

Inside stood the six warheads lately removed from the magnar missiles. They were about the size and shape of garbage cans, and were often so referred to. Silky maneuvered one of the infernal machines into a clamp, unbolted the cover plates and, by virtue of the authority invested in him as gunnery officer, began to do highly non-regulation things inside it. The mechanism was painstakingly temper proofed, and coping with its guard devices in null-gravity from inside a shielded suit reduced him to sweat and swearing.

Hours later he stripped off the suit, bullied the fruits of his genius into the ammunition loading lock, and shoved them out into space one by one. They drifted off in the general direction of Mars. Since every lookout on the ship was straining his eyes in the direction of Hidalgo at the time, they were not noticed.

Thereafter things settled back to utter dullness. Watch followed watch. The crew began to grow itchy with tension and disrupted routine. The petty officers did what they could to help maintain morale. Every square inch of exposed surface was scrubbed, waxed and buffed at least twice. Every accessible assembly was peered into, readjusted and oiled. One chief even had his detail out grinding smooth the linings of the rocket nozzles, normally a drydock job. In the wardroom the junior officers played bridge with baleful concentration and slowly became enemies for life. In the crew's lounge two signalmen labored in a tense circle of off-watch crewmen to make their TV set completely non-radiating. Lieutenant Harrod stayed on the bridge, returning salutes in silence, his dark mannequin face set and sleepless. Watch followed watch.

Spacemen were no longer used to the long stretches of null-gravity living that used to characterize the early days of space voyaging, and it took about a day for the men's

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appetites to begin getting back to normal. Even Wykerman, sometimes known as The Shark, was seen to pause and consider before accepting his third serving.

The talk was as unsettled and fretful as the stomachs. Wykerman had picked up a dozen rumors on various wavebands, and to these were added the ones homebrewed aboard the ship. With loud conviction it was argued fore and aft that there really was no Hidalgo squadron; that there was, but it was only one component of a huge combined fleet that was rendezvousing somewhere in space to descend on Mercury, or Luna, or Titan, or Ganymede; that it was deliberately cavorting around drawing attention to itself in order to mask a bigger and stealthier movement not far away; that it was going to invade the neutral planetoid Ceres; that it was out to show the flag around Earth and Luna; that it had been sighted in six different places, headed in eight different directions; that it had not been sighted at all; that contrary to all previous reports it was still orbiting peacefully around Hidalgo . . .

Only Silky, perhaps, showed any preference for the original belief that the unfriendly force might be actually headed toward the greater moon of Mars, and he had to admit that by this time it was beginning to look pretty unlikely.

"But not impossible," he insisted stoutly. "We haven't considered the possibility that they might be traveling slow instead of fast."

"What the hell good would it do them to drag their tails?" demanded Gardoni. "The longer they stooge around, the surer they are to get caught at it!"

"It could do them plenty of good, I think. Look what they've done to us so far. We're so mixed up right now we don't even know whether to believe they're real or not. I'll bet that right this minute our forces are scattered from New York to breakfast trying to cover all the mouseholes in the solar system at once. I just wonder how many of our own guys have caught a glimpse of each other's tails vanishing over the horizon and reported another sighting of the Hidalgo Herd? And I can think of other good reason for traveling at low-G."

"Like name one!"

"Like, how many men do you think forty-odd ships might carry?"

"Ten, twelve, maybe as many as twenty thousand."

"Just about right for hauling a division of marines, for instance?"

"Just about. What of it?"

"Well, if they only meant to give some target a bit of a rough going-over, they could send in eight or ten missile ships to dash past at high-G spraying broadsides all over the landscape. But when you're planning to land marines you use different tactics. Speaking as one who recently put forth an effort to behave like a rational animal under the influence of six gravities, all I have to say is that if *I* were hauling up a load of marines to grab a planethead somewhere, I would navigate receal gently. I would try to get them to their jumpoff point fresh and fit and

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ready to roar. I can tell you right now, without even seeing it done, that any marine who gets rushed into combat at five or six G's is going to be one sad excuse for a marine. Richey," he appealed to the navigator, "how long would it take to navigate from Hidalgo to Mars at only one-G?"

Richey produced his tools and performed his rituals. "Maybe fifty-six hours."

"How long has it been since they started out? Ah — about forty-five hours now. Maybe it's still eleven hours too early."

A groan rose around the table. "Another eleven hours out here in free fall," declared Gardoni, "and I'm gonna be ready to go over the side and *walk* back to Mars!"

"Well now look, I've been doing a little calculating, and I've noticed something interesting. Stars, have you got your pocket ephemeris?"

"Always."

"Well, take a gander at where Phobos is going to be — oh, about twelve hours from now."

Richey looked it up. "At first quarter or a little beyond, just past the sunset line of Mars."

"And what time will it be then in Lacus Solis?"

Richey consulted his four-planet wristwatch. "About eight o'-clock in the morning, local time."

"Check me if I'm wrong. Phobos will be out of sight from Lacus Solis for at least six hours after that."

"Yes, but not out of touch. There are four orbiting relay stations."

"Sure — unless somebody happens to let off a salvo of beam-following missiles at them. And then pop! pop! pop! your communications are gone. Meanwhile, about thirteen hours from now, Phobos will move into the shadow of Mars and be totally eclipsed. And if a fleet should just happen to come dropping down out of the sun on to Phobos just before it disappears into the dark, and shoots down all its radio-laser links, the rough boys would have about an hour and a quarter of total darkness to work in before Phobos comes out into the light again. During that hour and a quarter Lacus Solis can't tell what's gone wrong and their fightercraft can't see to help. A bunch of determined men can do a lot of work in an hour and a quarter."

Wykerman objected. "Even if they did come straight down out of the sun," he insisted, "they would be detected. The sun is noisy all right, but nowhere near noisy enough to cover forty warships."

"Well, just suppose the raiders folded their wings and coasted, pretending they were a passing clump of meteoroids or something? I seem to recall we were warned, last time we touched Luna, to watch out this trip for a local meteor shower known as the Martian Taurids. After all, it's not hard to pretend you're a meteoroid; we're doing it ourselves this minute. Just call us the *Rambling Rock*. What we can do, other people can do."

"Just suppose — just suppose — just suppose!" growled Gardoni, shaking his cigar like a dog shaking

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a rubber rat. "Give it up, kid. You can't pile up that many just supposes; they got round bottoms."

"It's not all that far-fetched, First. Nine years ago, during the Pallas Incident, General Koloviev took Jupiter VI just that way, remember?"

"A lot of good it did him too. We got Jupiter VI back the next week, remember?"

"Guns," said Richey drearily, "I'm afraid this particular configuration of moonrise and moonset on Mars doesn't mean a thing. During this month it's been recurring — not exactly, but approximately — about every forty-nine hours. It'll go on that way for another week or two. It's just pure coincidence. I'm sorry."

"Well, all it takes to prove it one way or the other is twelve or fourteen hours more —"

The PA began to hum. Instantly the officers forgot their argument and sat up tensely to listen.

III

"Now hear this. Now hear this. Attention all hands, this is the skipper speaking.

"We have just received a new signal from Headquarters. The latest sightings indicate that the Hidalgo squadron has apparently given up its mischievous intentions, if it had any, and is heading for Ceres, which is at present on the other side of the sun. Accordingly we have been ordered to put about and return to patrol duty. I am sorry, in a way, that we have to close this expedition so inconclusively, but we can all be grateful that there was no real cause for alarm after all. I want to thank all hands, fore and aft, for your fine performance. Now we will secure for normal flight. That is all."

Chief Engineer Haig instantly left the table, a can of beer still in his fist, and darted down the descending well to supervise the restarting of the engines. The others braced themselves for the welcome return of weight and vertical orientation.

Ten minutes later Silky was back in Fire Control, physically grateful to be under acceleration again, but mentally convinced that giving up the search so early had been a mistake. He rehearsed his arguments over and over to himself — and stumbled, each time, over the lack of positive facts — until the intercom broke in on him.

"Fire Control, Thornton."

"Harrod, bridge. Guns, before we return to Mars we have to go pick up those drifting magnar drones."

"It's not strictly necessary, sir. Each of them contains a destruct charge sufficient to vaporize it. If you think they're a menace to traffic I can demolish them from here by pushing a few buttons."

"Sorry, I can't allow it. Regulations don't permit me to destroy unexpended armament for any reason except to keep it from falling into other hands. We have to pick up all of them. We'll reach the area in about six hours and send out the reconnaissance fighter to bring them in. Are their grappling rings still exposed under all that extra metal you welded on?"

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"Yes sir. The pilot shouldn't have any trouble getting hold of them. The magnetic grapnel guides are still exposed, too. We were careful not to foul up any of the recovery gear, just in case."

"Good. As soon as they're aboard, you and Wykerman and all your men get to work and restore them to normal operating condition."

"Magnars out, sir?"

"Magnars out, warheads in, all spare parts returned to storage. It's a nuisance, I realize. You two and your men did a magnificent piece of improvisation under uncommon difficulties, and we couldn't have carried out our mission properly without it. A complete account is going into the log, along with my recommendations for future emergencies, and you and Wykerman will get due credit. One of these days I hope to see magnar repeater missiles made standard equipment. But for the present, of course, everything has to be restored to TO&E condition, ready for the next inspection."

Silky felt himself go stiff as a wooden Indian; gusts of freezing wind began to chase each other down his back. He pictured the six doctored warheads bobbing far away in space, while Harrod innocently waited for him to produce them and put them back where they belonged. He cursed the *Table of Organization and Equipment,* the top-sacred TO&E, with voiceless fervor, and tried to keep panic at bay.

"Yes sir. No trouble at all. If that's what the regulations say, we'll comply immediately, sir."

Then the hobby he had been riding in the wardroom recurred to him, and he grabbed at it as it floated past. It might do for camouflage . . . "Begging your pardon for changing the subject, sir, may I ask a question?"

"Of course."

"Sir, although we've received orders to go back on the beat, nobody yet has given us any proof as to where the Hidalgo squadron is *actually* bound. Mightn't it be wise to wait in this vicinity for some kind of positive confirmation?"

"Mr. Thornton, we have been *ordered* back on patrol. I don't know what that means to you, but to me it means now! Furthermore, Fleet Intelligence seems to be satisfied that the Hidalgo squadron is now two hundred million kiloms away from here. And they are not required to send us *any* confirmation, of *any* kind, either now or later or ever at all."

"Yes, sir. Forty-eight hours ago they were convinced that the squadron was on its way here."

"Mr. Thornton. Neither you nor I have the qualifications — much less the data — to argue with an Intelligence evaluation. We have been ordered back to patroling the traffic lanes, and we are on our way. Just as soon as we get the torpedoes aboard."

"Yes sir. Just one final query?"

"Yes?"

"Sir, would it be permissible to leave one of the torpedoes in this

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neighborhood to — well, monitor the area until the next time we come back?"

"Mr. Thornton, I have no authority to take any liberties with an order from Fleet Headquarters. It would indicate a tendency on my part to indiscipline and insubordination. To put it briefly, and for the third time, we are going to pack up and clear out of this area *bag and baggage*. Do I make myself clear?"

"Extremely clear, sir. I withdraw the question." And Silky leaned back in his seat and gave himself up to nightmares of the wrath to come. Not only was he unable to produce the warheads, he was also forbidden to send out the only kind of device that could help him locate them. Once he could find them, he might somehow . . . But they weren't going to be found. Not now. Not soon enough, anyway, or by the right person.

After the next meal he sought out Wykerman.

"Signals, did the skipper tell you we're going to have to take those magnar missiles apart again and put all the pieces back where we found them?"

"Yep. But I always more or less figured he would. You know how it is; you can't take liberties with Fleet hardware except on an emergency-and-temporary basis. Once when I was a cadet a fuel cell explosion wrecked our main navigation radar transmitter. We had to jerry up a new one from spare parts and cannibalize a couple of stages from the landing-approach radar. But before the next inspection we had to tear it all down again and put all the parts back in the bins and the LAR, because that's where the TO&E says they should be. It's all right to have a wrecked radar; accidents will happen. But it's definitely *not* all right, on inspection, to have an extra radar set that TO&E says doesn't exist, or to be short of the TO&E stock of spare parts."

"Well, Signals, I've got troubles. There are some spare parts I'm not in a position to replace."

"Charge 'em up to breakage and deterioration, and put in a good story to cover it."

Silky winced. "I don't have to invent a story, I have to suppress one. I got carried away yesterday by a bright idea for using the warheads we took out, fixing them up to annoy the other people whenever they showed up. Only they didn't show up. And now I find I'm going to be required, within the next few hours, to produce six warheads that are — to put it mildly — not available at present."

Wykerman stared at him in genuine concern. "Can you fake 'em?"

"How?"

"Any way at all. Like, say — they're meter-high cylinders, aren't they? Now where will you find something shaped like . . . well, I have an idea. You can requisition half a dozen empty carboys from the galley — figure out an excuse — fill 'em with cement, spray 'em with red paint, stencil on the official labels, doll 'em up with a few convincing bolts and nuts and rubbish

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like that. An inspector would never know the difference, unless he was a gunnery expert himself. And the first chance that comes along, you get rid of 'em somehow. Lose 'em in firing practice or something."

Silky burst out laughing. "Thanks, Signals! If I hadn't been in such a bright green swivet I might have thought of it myself. I'm indebted to you for life, Tovarish! All that I have is yours, from my youngest wife even unto my oldest Scotch."

Wykerman grinned. "Just cover for me next time."

But the more Silky thought about it, the less sure he became that it was really the type of thing he would have come up with himself. On the surface it offered a perfectly plausible way out. Faking the warheads would take time, but nobody except himself was likely to be checking on them in the next two weeks, so there was no real hurry. It was customary to hold firing practice with cement-filled dummy warheads. He could easily have the dummies put in for the present, on the pretext of running tests on the real ones. That would afford him time to prepare the fakes.

After that it would be only a matter of detail to rig a few accidents that would dispose of the fakes before they were detected. Cruising missiles sometimes ran out of control and had to be blown up. Others had been known to collide with drifting rocks. A few had destructed spontaneously, after long exposure to radiation in space made their demolition charges unstable. He could arrange whatever was necessary to balance the books.

Nevertheless he could not bring himself to overlook one flaw in it: the possibility of sudden combat. For two days past the *Gedrosia* had been hanging on the verge of possible fire and slaughter; and somewhere, before the week was out, fire and slaughter might break out in reality. Officially the all-clear had been blown, but Silky could not get rid of the feeling that the changeless shining skies around him might rip wide open at any moment. He could not at any price, even to save his own good name, send the ship he loved into danger armed with blanks. The more he thought about it, the more certain he became that he would have to make some sort of attempt to recover the real warheads, and that he had better do it as soon as possible. He was not sure just how to go about recovering them, and even less sure that he could decontaminate them adequately after what he had done to them. It would be rather like trying to put smoke back in a cigarette. Well, just perhaps, skillful manipulation and decontamination *might* save the unsmoked "stubs." Half a bank is better than none.

He pondered. The ship would have to lay over on Mars a day or so to refill its tanks, depleted by the chase. He could probably get shore leave and hire a small craft, ostensibly for sightseeing, then run out into space to collect the warheads and bring them back. Drop them in the desert, rent a shielded truck and

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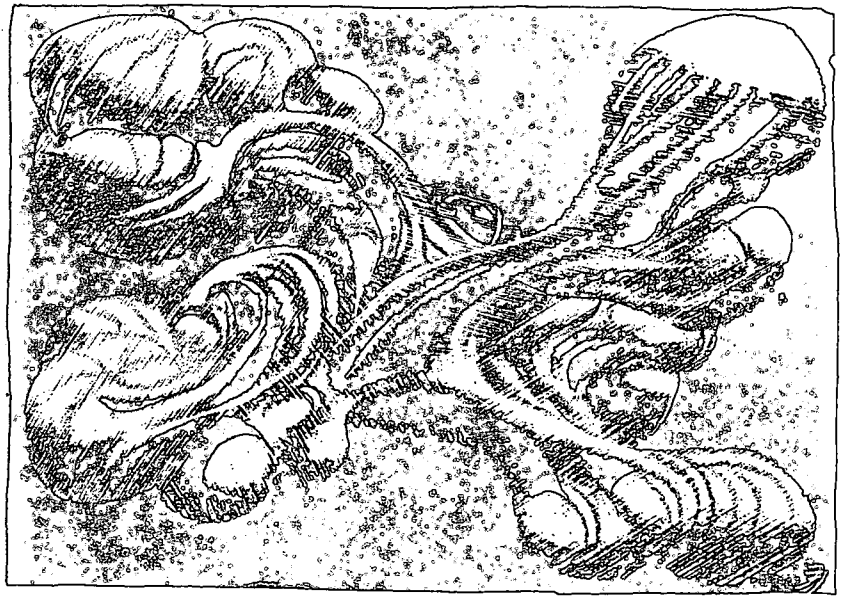

pick them up, hoist them aboard during the night, swathe them in cadmium foil — and see that his men were busy elsewhere . . . It called for fast work, abnormal quantities of luck, and one other thing: knowledge of the warheads' exact whereabouts in space. He had to be able to go directly to them. Therefore, they had to be found, and quickly.

There was only one possible way. Pacific invasion or no Pacific invasion, direct orders to the contrary or not, he was going to have to send one of the magnar drones to find them for him.

But within the next few hours he would have to help tear down all the drones and put their magnars back in storage.

The only possible chance to send one off on another mission, therefore, was to turn it around and relaunch it as soon as it was brought aboard, in direct defiance of orders. If Harrod happened to find out, there would be some very painful explaining. But the only alternative, he felt, was to risk the life of the ship.

Silky shook his head at himself in dreary amazement. Perhaps he might have gotten away with merely throwing millions of dollars' worth of heavy armament wantonly into space. But what he would never be able to defend was that he had done it on his own initiative, without orders or covering authorizations, without even the elementary precaution of informing his superior. More and more desperately he wondered what demon could have

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taken possession of his senses long enough to blind him to all the rules and regulations he was splintering so heedlessly. At the time he had felt only that here was something that needed to be done. But now all the traditions and laws of the Fleet, that had been so arduously hammered into him during training, began to stand up and demand their rights. He had thought then he was acting in the best interests of the ship and the Fleet. And if it came to that, he thought so still, by the red god of battles! But try and prove it now.

What in Hades could have made him, yesterday, so recklessly sure he was right?

Silky had never knowingly disobeyed an order since he took the oath in a far-off recruiting office on Earth; and now he was about to. It gave him a cold hollow sensation. And abruptly the moment was upon him.

The *Gedrosia* slowed down to quarter-speed as she entered the pickup area. The gunners and signalmen, spacesuited, lined up beside the ammunition loading lock to take the recovered torpedoes aboard. The recon fighter, piloted by a Marine sergeant named Whalen, had already been launched in pursuit of the nearest one, and within ten minutes the torp was being hauled in by the magnetic grapple.

As soon as the signalmen had taken possession of their magnar set, Silky put his two gunner's mates to work removing the fuel drums, pipes and braces. He himself took an ultrasonic buffer and started grinding off the weld spots, then retouching the spoiled paint job. While the ratings were still busy taking apart the froufrou on the first missile, the fighter showed up dragging the second, and Silky put down his buffer to go out and bring it aboard. He hauled it in close, then plugged in the jury-rigged starter cables and restarted the engine. As the torp cast off and vanished astern, Silky prayed that no one was watching. When his men paused later and found themselves one missile short, Silky said nothing and allowed them to conclude that one had been lost and would have to be abandoned.

The five torps were cleaned off, repainted and stored in their launchers, and the gunners went unsuspiciously back to their quarters to shower and wait for mess call. Silky retired alone to Fire Control, activated a control transmitter, contacted his bird and began directing it toward Mars. He went down to mess, then came back up and checked the missile's progress. It was getting close to where he expected to find his scorpion's eggs, but reporting no contacts yet. He set it to follow Mars in orbit at a safe distance. It would be a while before he could determine what further adjustments it would need. Without them it would drift in a few days into a long orbit around Mars, with a period anywhere from a couple of weeks to a month. But he was sure he could keep it from wandering too far out of place before he got what he needed from it.

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He retired to his quarters and began working out his plans in a notebook, listing and memorizing every detail so that, once on Mars, he could get out and get back without losing time or attracting attention. First of all, he intended to go ashore the very first minute decency permitted; next —

"Now hear this. Now hear this. Attention all hands, this is the skipper speaking.

"Instead of a short stop at Mars, as we anticipated, we have been ordered to report directly to Luna for further orders. We expect to arrive in about five and a half days. That is all."

IV

When Silky went on watch the next morning, he met Harrod just leaving the bridge. The latter turned to him in passing.

"Mr. Thornton, as soon as your watch is completed, will you please report to me in my cabin? I'm making up the official report on the operations of the last three days, and I need some information to clear up an apparent discrepancy."

"Aye aye, sir."

When Harrod was gone, Silky automatically opened the logbook to check the latest entry. He stood looking at it for a long long time without noticing what it said.

When the short four hours were over, he yielded the bridge to Gardoni and went down to knock respectfully on the skipper's cabin door.

"Hello, Guns," Harrod greeted him cheerily. "I hope I didn't scare you by asking you to step down here. It was simply that I couldn't stay and talk to you on the bridge, because I have to get my report on this operation shaped up and sent off as soon as possible. Last night I was going through the records of the missile pickup and noticed a discrepancy, or thought I did. Whalen reports that he picked up six torpedoes, and according to the radar tapes he actually did make six sorties. But you and Wykerman report only five taken aboard and restored to combat condition. Have you any idea what might have happened? Could one have broken loose perhaps, so that Whalen had to go after it twice, or what? Anyway, we seem to be one missile short."

Silky pulled a thoughtful face and stared at the wall while he considered his answer. Wykerman had offered him a way to wriggle out from under his predicament; Harrod was offering to let him get away with it.

The missing bird, and the eggs it had gone to find, would just have to orbit Mars unwatched until his return. Meanwhile, the lieutenant suspected nothing yet and was openly asking to be kept suspecting. Silky's plans were in temporary disarray, but now he might find a chance to salvage them after all.

It looked perfect except for one nagging uncertainty: where *was* the Hidalgo squadron? What if, in spite of all information to the contrary, it *did* show up at the wrong time and place? The ship's battlereadiness

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was Silky's charge, and Silky's alone; and he was too young not to be impressed by the responsibility. No matter how circumstances might tempt him, be began to realize with abrupt and startling clarity that if he relaxed his efforts to recover the lost charges he would be, in his own eyes, a traitor to the ship.

And now, with a sort of terror, he discovered that he was about to use the last most desperate resort. He was about to declare the truth.

Coming unconsciously to attention, he waded in, as a foot soldier wades into a barrage.

"Sir, I don't think you're going to like this."

Harrod looked at him sharply. Silky was standing stiff as a lamppost, with his eyes fixed rigidly on a small ventilator grill in the wall and his features taut. The skipper recognized the signs all too well; he braced himself and waited.

"Sir, I turned that drone around myself, and dispatched it to the vicinity of Mars."

"Directly against my orders?"

"Yes sir."

The skipper was silent for a moment. He had never had to deal with direct disobedience before. Stupidity, yes; carelessness, yes; grumbling and low morale, yes; space lawyers, yes. But never rank insubordination, defiance of a clearly understood order. For a moment he couldn't think of anything quite suitable to say.

He got up, walked in front of Silky, and seized his gaze as if by force.

"You understood clearly that you had no authority to do this?"

"Yes sir."

"And that I denied permission?"

"Yes sir."

"Then how do you justify it?"

"I can't, sir."

"Did you realize what the consequences would be to yourself and to your career? After all, there are very few offenses in the Military Code more serious than open disobedience. Didn't you know what I would have to do to you?"

"Yes sir."

Harrod stared at him for long seconds, eyes boring into eyes. Then he turned and started pacing.

"When a man throws away his career with his eyes open, he must have a pretty powerful motive," he said in a tone unexpectedly conversational. "What can you possibly gain by this? Are you a spy?"

Silky blinked in surprise. That interpretation had never occurred to him. "No sir."

"I don't think you are either. A spy always makes at least a feeble attempt to cover himself. Then what are you?"

Silky thought it over. At last he said seriously, "A nut, sir, I'm afraid."

Harrod looked enlightened at last, and even grimmer.

"In other words, you were so sold on your own hunch about the other people's plans that you were ready to ignore not only the contrary evidence, but the Military Code and the regulations of the Fleet, to gamble on it?"

"Yes sir."

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"And what's the point of maintaining an Intelligence arm, I would like to know, when we've got hunch players calling our signals? And now we can't turn back, because we've been ordered to report to Luna without further delay. So what do we do if a combat situation arises and we're one missile short?"

Silky stared more intently than ever at the ventilator grill. "Sir, we're six missiles short."

The skipper stopped pacing as if he had rammed an invisible wall. There was a long incredulous second of silence. Then, "All right, tell me the worst. I think I can take it now."

"Well, when we were lying to, expecting to see the other people come around the bend any minute, I took the six warheads from the magnar drones — which I thought at the time we wouldn't be wanting again — and rigged them up as nuisance devices to — as you once put it, sir — amuse the competition. I jettisoned them into the expected path of the other people. At the time, I was under the impression that I was doing something clever," he concluded lamely on a note of despair.

"When I realized that we were breaking off and going back on patrol, I knew that it would be necessary to recover the drifting warheads. So I turned one of the magnar drones around and sent it off to locate them — and to keep watch for any unhealthy influences near Mars in our absence, sir."

"You thought—six—nuclear warhead — were — no—longer—*wanted?* Do you have the slightest notion how much those devices cost?"

"Yes sir. Eight hundred and fifty thousand dollars apiece?"

"And *six* of them at that rate —"

"Five million, one hundred thousand, sir."

"Do you have any idea how long it would take you to pay that back out of your six hundred a month?"

"Yes sir. Seven hundred and eight years and four months, sir, barring promotions and raises — unless I invested my pay at compound interest, in which case —"

At that point Lieutenant Harrod summarily took over both sides of the conversation. He planted himself at parade rest with his face six inches from Silky's and opened fire point blank. The bombardment may have lasted for five minutes, or fifteen, or several times around the clock. At any rate it was well managed. It hit every soft spot and it went in deep. Lieutenant Harrod came from an old Service family and he knew how to do these things right. Finally he sat down.

"If it's any satisfaction to you," he rasped hoarsely, breathing a little hard from his exertions, I'm going to do whatever I can to keep this off the books and you out of a court-martial. It's not that I pity you in the slightest; in my opinion you deserve whatever happens to you. But if it ever got into the record that I was so insanely negligent as to let you pull off not one but *two* stunts like this right under my nose, I'd end up as the youngest retiree in the Fleet!

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"So to save my own bacon I'm forced to make a stab at saving yours. You'll have to go back alone and pick up the missile and the warheads, and bring them back as quietly as possible. How you do it is your problem, but it must be done immediately. I have to hold up my final report until you're through. But I tell you one thing in advance: your next voyage will not be on the *Gedrosia*. I'll have to give you a suitable recommendation, of course . . . Do you know offhand what sort of armament is carried by cattle ships?"

Since Sergeant Whalen was the only man aboard qualified to fly the recon fighter, Silky was forced to use a lifecraft for his errand. The prospect did not appeal to him in the least. The *Gedrosia* carried two spaceboats because regulations required them, but they were a far cry from the sturdy titanium-hulled pinnaces sported by major ships. The corvette had no room in her sixty-meter hull for anything so pretentious, so her spaceboats were collapsible. Their hulls were simply double-layered plastic balloons, inflatable while launching. Of course the plastic was the toughest known, reinforced with glass fiber and other more exotic materials, and warranted blowout proof; but that remained to be seen. The balloon boats were *said* to be perfectly sound and spaceworthy. Each had a decent minimum of controls, instruments and electronic gear, and could accommodate fifteen men (including one in the head) when fully inflated.

But all the same it was a terribly frail-looking bubble in which to sail the Unshadowed Main. In any emergency most of the crew would have preferred to stick with the ship and take their chances. Silky, who liked as well as any man the feeling of a good stout wall of astralloy between himself and The Big Old Nothing, was in this of one mind with the majority.

He might have felt a little more tolerant, nevertheless, if only the spaceboat had been slim and dangerous looking like its mother ship. But to be candid, what it resembled most when fully inflated was a rather tired pumpkin, with engine and controls mounted in the axis. A coat of fluorescent orange paint striped with radar-reflecting foil carried the resemblance to painful lengths. No lifecraft drill was complete without ribald references to Cinderella's coach and Peter Pumpkin-eater's marital tribulations. Altogether the *Gedrosia's* starboard lifeboat was about the most unheroic-looking vehicle that ever bobbled across the sky. Silky let himself into the lifeboat compartment and glared at the wadded orange mass with immortal loathing.

To enter, he had to open the hatch at the top of the central cylinder and back in like a hermit crab, dragging his equipment after him. Once in, he sealed the hatch, opened the lock, switched on the engine and blew free into space. At that point he was supposed to pull the switch that would inflate the hull around him. But he decided he just

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didn't have the nerve to flaunt that flaming obscenity under the eyes of his shipmates like a baboon's behind. At the moment the plastic was wrapped around the core in a tight cocoon that still vaguely resembled a respectable rocket ship, so he left it that way and breathed from his suit tanks until he was twenty miles from the *Gedrosia.* Only then did he care to blow up the balloon.

Setting course for Mars was a problem complicated by the diverging courses of the planet, which was making 2,000,000 kilometers a day in one direction, and the *Gedrosia,* which was making a good deal more in another. The lifecraft had a rather small engine; even with only one man aboard its utmost was a feeble gee-and-a-quarter. Silky calculated it would take him about twenty-four hours to kill the transverse velocity he had picked up from the ship and get back to the orbit of Mars. He set up the course with great care, making star sights through the navigation telescope on the instrument board. He adjusted the controls with long and fiddling nicety, and then leaned back in his seat to make further plans.

His first puzzle was, how to secure the magnar missile when he should find it. The lifecraft's batteries were far too feeble to start the missile's fusion engine up again, so he would have to haul the thing back bodily somehow. But how?

A towing cable was out of the question; the rocket jet would cut it in no time. There was absolutely no way to fit the drone inside the pumpkin, even without its bulging girdle of extemporized fuel tanks. Silky wondered if he could contrive to lash it to the hull somehow. Spacemen are as expert as sailors at lashing down cargo, but the balloon boat presented peculiar difficulties. Its hide was smooth and slick, with only one protuberance anywhere: the red-hot rocket nozzle. The various antennas were inside the hull, and there were no cleats or rings on the exterior. Altogether, Silky concluded sadly, this was one time when the Fleet had carried clean design a little too far.

He had suggested urgently that Whalen be sent out in the recon fighter, with its excellent and efficient nets and grapnels for picking up objects in space. But Harrod had adamantly maintained that the man responsible for the trouble was the one who was going to clean it up. Besides, as he pointed out, Silky could be temporarily replaced by either of his two gunner's mates, whereas Whalen was the only fighter pilot aboard.

It was a pitiful waste, Silky thought; all those magnetic guides and rings on the missile, and nothing to fasten them to.

Magnetic guides?

He gazed up at the underside of the entrance hatch. It was mostly stainless steel. With a few hundred feet of wire he could improvise field coils that would turn the hatch cover into an electromagnet, and hold on to the missile with that. Provided he could find enough wire to give him a decent field density.

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He began looking over the lifeboat's equipment with a cannibal's eye, calculating in his head how many amperes he could draw off without cutting engine efficiency too low.

Unfortunately, the only window in the lifecraft was a circle of transparent plastic around the hatch. It looked as though he was going to have to finish his trip with the drone's ungraceful bulk practically blacking out his field of view. And the lifeboat was going to steer pretty drunkenly, he thought, with three or four tons of missile and sloshing fuel balanced on its nose, but it looked as if there was no help for it. Anyway he didn't think he was going to have to find his way back to the ship by dead reckoning. Harrod would surely grant him a beam to home in on.

He hoped the warheads would give him no more trouble than he expected, which was quite a bit. To get them aboard he would have to don a shielded suit, evacuate the pumpkin, then cut a flap in its side big enough to admit the hot cans. When they were all bedded down in thick cocoons of cadmium foil and shielding plastic, he would patch the hull and blow it up again. But until he was picked up by the ship he would have to live inside the shielded suit, breathing shielded air, drinking distilled water and eating not at all. So he planned to postpone taking the deadly things aboard as long as possible.

He began working up his field coils. The only wire aboard that could be spared belonged to the boat's magnar; he was traveling so slowly that he thought radar would be adequate, weak as the boat's set was. He ripped the magnar set apart and began unraveling its numerous coils.

A few hours later he picked up the ten-secondly "beep" from the distant magnar missile. He measured the angle with the Radio Direction Finder, made a few lazy passes with a slide rule, and altered course thirty-five minutes of arc.

Hours passed.

Silky ran out of light reading and corrected the course again. He ate. He dozed. He woke to find that the "beep" had drifted out of the RDF beam. After a bit of hunting he found it again. And corrected his course again.

More hours passed. He read the lifeboat's survival manual. He ate. He drank. He dozed. He woke and corrected the course again.

The lifecraft seemed to stand absolutely stationary inside the sphere of stars, its little motor droning foolishly. Silky had noticed the same thing through the ports of the *Gedrosia* times without number, but it merely seemed amusing then that a body moving five or six hundred kiloms a second should give so little sign of it. Now it oppressed him. Driving an empty lifeboat across an empty sky toward an invisible target, all by oneself, had some of the less charming aspects of sitting up alone in an empty railroad station at three o'clock in the morning.

He had written home about "the terrifying loneliness of outer space"

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the expected number of times when he was a cadet, but he had always written the words aboard a ship jammed with men, machinery and movement, usually while sitting on a bunk beside a milling aisle in a noisy focsile. Now for the first time he was really experiencing the thing that spacemen rattle on about so glibly, and it froze his soul.

There was no sound in the boat but the periodic "beep" from the RDF and the small subaudible drone of the motor. He turned on the radio receiver for company, but found it silent. The Earth-Mars radio beam passed to one side of him, with too little scatter to pick it up. He tried the commercial-ship band, but not a whisper came through; those calls too were beamed at Earth or at Mars, and the leakage was minimal. The uncompanionably efficient receiver even had a computer stage to filter out static, so that on all bands it offered him utter velvet silence. In anger he turned up the gain to maximum, trying spitefully to make the speaker squeal. But the set was too stable. It stayed silent. It wouldn't even produce an AC hum, being run on DC from the ever-purring fusion engine.

The only noises he could hear were his own heart and lungs, and the tiny creaking of his seat. He knew that now and then a dust particle must be striking the outer fabric and exploding or ricocheting with a tiny snap, but the double hull kept such noises out. At last his heartbeat and the rush of his breathing filled his ears until he began to feel frantic. He dug into the medical kit and found some sedative capsules — the first time he had ever resorted to such a thing in his life. He ate again, not from hunger. He dozed again, not from fatigue.

The alarm tinkled. Fifteen hours out: time for turnover. He took the controls, rolled the pumpkin over upside down and lined it up as well as he could by instruments. The sun was now blazing through the front port into his face, so star sights were impossible.

Nine hours more to the search area. And then he would have to locate the missile itself, a tiny shining sliver among the stars, and use it in turn to locate the warheads. He wished the search would take a long time, but he was afraid it wouldn't. He had radar, he had the missile's magnar, he had RDF and a couple of ray and particle detectors — in short, he had no excuse. At most, forty-eight hours' quartering of the backyard of Mars should indubitably turn up anything hiding there.

And that was too bad, because his voyage was only just beginning, and he was going to have more time, much more time, on his hands in the days to come. The *Gedrosia* was well on her way back to Luna by this time, far out of range of the spaceboat. He would have to wait in the vicinity of Mars until she came back. With luck, that would be only ten days from now. But if orders delayed her on Luna, or sent her off on another errand for a while . . . At any rate, he would have plenty of time to try decontam-

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inating the jiggered-up cans before he had to take them aboard and bring them in.

In effect, he was serving a short but uncertain sentence in solitary confinement; Harrod's idea, no doubt, of the sort of experience that might help settle a yeasty young man down.

Silky toyed with the idea of setting down at Lacus Solis for an unscheduled liberty, and then going back up to search the sky a couple of days before his ship returned. But then he realized that his only chance of getting off without a court-martial was to carry the whole thing off in silence and secrecy — and solitude. Two hundred and forty hours — or more — alone in space, and the fleshpots of Lacus Solis practically within arm's reach! St. Elijah have mercy on a poor sinner!

He tried singing to himself, but after a while he could no longer pretend he was enjoying it. He began to construct furiously eloquent and crushing retorts to an imaginary skipper. He rehearsed aloud his defense before a court of inquiry that might some day want to know exactly why he had jettisoned $5,100,000 worth of radioactive secrets for any wandering snooper to pick up and take home. Each time he went over his story it sounded a little thinner. He grew desperately eloquent, ringing in more and more farfetched plans. Eventually he found himself taking both sides of the dialogue, and making a pretty crushing case for the prosecution.

He lay back in his seat again, trying to grab one more doze. He hoped, against hope, to be wide awake when it came time to play hunt-the-slipper. He lay very still, staring at the underside of the hatch cover and the homemade field coils he had rigged there. He tried not to listen too hard to the silence, millions of miles deep . . .

With a strange sense of discontinuity he realized that he heard a new sound. What sound?

Soon it came again: the "tang!" of the magnar alarm.

But he had taken the magnar apart!

He hurled himself up to a sitting position so suddenly that his head spun and lights danced across his vision. The magnarscope, of course, was blank.

"Tang!"

It was coming, not from the gutted magnar set, but from the Radio Direction Finder, which was still tracking his drone. He went into a frenzy of switchflipping and finally managed, after half a dozen errors, to bring in the picture from the missile.

It was clear and sharp and three-dimensional. It showed the arc of Mars' disc at one edge, and the nearby circlet that was Phobos, and a tiny cluster of bright dots close to the center. His warheads? Good! He wouldn't have far to look, once he found the missile.

At the edge opposite Mars a spatter of dim dots and streaklets drifted slowly into the picture. A meteor cluster, he guessed; a bunch of Martian Taurids drifting down to make

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a fiery shower in the Martian night sky. He was about to lie down again, waiting for the radar alarm to tell him he was getting close. But he thought he glimpsed a faint movement, and involuntarily bent to look closer.

Faint through the dusting of "meteoroids" ran a dim many-stranded ribbon that seemed to fade even as he watched.

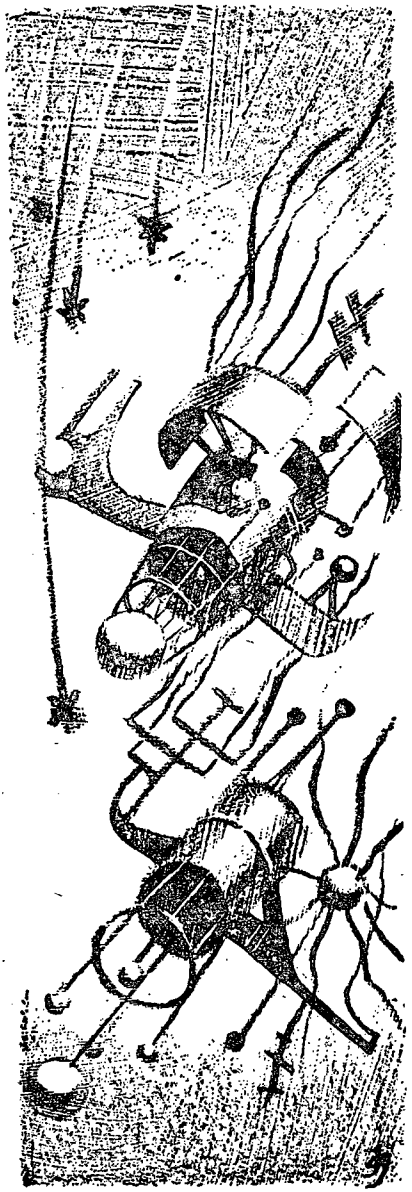
Ion trails!

The drifting ships had cut their engines some time before, but the betraying plasma jets, not yet dissipated into space, had continued to drift along with them toward their target. Another five minutes and the trails would have faded beyond detection; but the five minutes had not been granted.

It was the Hidalgo squadron at long last; forty-nine hours later than Silky had expected them, but indubitably there, and coming straight down the center of the road.

V

Silky's hand leaped to the radio transmitter, but the movement died an inch from the switch. It was his plain duty to sound the alarm at the top of his fifty watts, but also it was plain suicide. Thirty or forty seconds after he went on the air, a swarm of missiles would be on their way to cut him off. He paused a moment to plot the location of the Pacific force against his own, and came to the conclusion that once he flipped the transmitter switch his life expectancy would be something under six minutes.



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The alarm must be given immediately. The marauders were already making their final approach, ready to shoot. The big assault itself could not possibly be more than an hour away.

But the alarm must also be given clearly. Silky's warning must be received and plainly understood before he died. He pulled out the book's logbook and began to compose, with care, the message he must send. When it was written out he propped it up on the instrument panel in front of him, so that he could read it over and over into the microphone as many times as fate allowed.

There was no hope of escape. The clumsy low-powered pumpkin had just enough engine to navigate with. The slowest transport in the Pacific Fleet could outrun it fully loaded. To the beagle-nosed projectiles that would shortly be screaming toward him, the lifeboat would be as good as a stationary target.

He hunched over the panel, picked up the mike and made a dry run, rehearsing the words, mouthing the dry hot metallic taste of fear.

"Calling Phobos Station. Calling Phobos Station. Emergency! Emergency! Emergency! Large number of unidentified spacecraft approaching from sunward, heading directly toward Phobos, speed about four-zero relative, estimated distance two-zero-zero-thousand, ETA fifty minutes. Repeat: Calling Phobos Station —"

His voice was mockingly clear, smooth and businesslike, not like part of himself at all. He swallowed hard, but no saliva would come. "*Morituri te salutant,*" he muttered to a far-off Lieutenant Harrod. "But I hope you realize, skip, this business of dying by the numbers on demand is apt to raise heck with my furlough plans."

He reached for the transmitter switch again, with a steadiness somehow shocking to the part of his mind that never ceased to hope, and pushed.

A circuit breaker banged over and the instrument lights blinked. The radio receiver grated raucously. Silky smelled scorched plastic.

Hurriedly he switched the transmitter off again and swung open the front panel. There was a short in the power supply, and it had arced messily. There would be no transmissions today.

Simultaneous relief and frustration hit Silky an almost physical blow. An enormous icy shiver went down through him all the way to the tips of his toes, and for a moment the suddenly broken tension left him so limp that he had to drag in his next breath by main force.

Gradually the enormous drumming of his heart slowed down, and his thoughts began to move once more. Death had laughed at him and ducked out of reach; still he must chase it and catch it again. He sighed heavily through his teeth and began looking for alternative methods of suicide.

He thought about rewiring the receiver. If it had been one of the electronic kits he had played with since boyhood, he could easily have haywired it into a feeble but usable dot-dash transmitter, keying it with

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a loose wire and a pair of pliers. But the moment he opened the receiver's front panel he had to give up the idea. This was no schoolboy kit, but a standardized single-function piece of military hardware. Its innards were a neat checkerboard array of prefabricated modules which could be replaced only by other identical prefabricated modules. Its wiring was baked into the chassis and covered with an unbreakable glaze. There was no way to rewire it; there was simply no way at all.

Silky swore in loud frustration. "It's not just foolproof," he ranted to the silent heavens, "it's even genius-proof!"

The clock was ticking away. The Hidalgo squadron would reach Phobos, if he had measured rightly, in forty-seven minutes.

Frantically he searched the cockpit for alternative ways to get a signal out. Radar? He couldn't modulate the beam except by switching the set on and off, on and off again, and if he took time to do that he might be dead before he got all the way through his first transmission. Still, it was worth a try.

He horsed the pumpkin around so that it faced Mars, and looked through the navigation telescope to line up his beam on Phobos. And looked, and looked. And finally it penetrated. Phobos had just gone out of sight around the edge of the Martian globe. And Lacus Solis had not yet come into sight around the other edge. The radar beam couldn't reach either of them. It would hit one of the radio relay satellites, no doubt, but since it wasn't using a regular communication wavelength it would be politely tuned out and ignored.

From forty thousand kiloms in front of him, the magnar missile could see Phobos plainly, and was showing it to him on his cabin scope. But there was no way to use the missile as a relay, no way of making it bounce a warning around the corner and into the ears of the unsuspecting victims.

The radio receiver and the RDF were both working perfectly, but they were both non-radiating. He had exactly one other method of communication aboard: a flare pistol.

The Hidalgo squadron would reach Phobos in forty-one minutes.

Silky stared into the magnarscope, trying not to feel frantic, trying to think. For the first time in his life he was looking at the Gunner's Dream; a whole covey of sitting ducks. And of course it had to turn out to be the Gunner's Nightmare; all those fat and helpless targets, and not a thing to shoot at them with! The only weapons aboard the lifecraft were a pair of handguns with an effective range of one thousand meters.

If only he could have been a fighter pilot at this moment, to swoop falconlike in among them hurling doom in all directions!

Well, swoop he could. And if he could launch nothing else at them that would do any harm, he could — like the Headless Horseman of Sleepy Hollow — launch the pumpkin itself.

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With sudden excitement he began to plot an interception course.

The lifeboat was approaching the squadron's path at a slightly acute angle, traveling about thirty-five kiloms per second. When he first spotted them they had been about sixty thousand kiloms away from him, but the distance had dwindled considerably in the last few minutes. They were moving from right to left across his bow, according to the conventions of the magnarscope; he would have to "lead" them by . . . how much? For several minutes he was happily immersed in angles and velocities.

Then, with a young man's casual readiness, he throttled up the engine and headed full tilt for sudden death. Impact in twenty minutes.

If the Pacific ships marked his coming — and how could they not? — they would have to give themselves away, he was sure. They were almost bound to start shooting, and the first missile that exploded would shatter their secrecy for keeps. Or if they simply scattered out of his way, the mere starting up of their massive engines would ring magnar alarms below. Either way their protective anonymity would be gone.

But suppose they simply sat tight? They were coasting in a loose haphazard formation, imitating the randomness of a meteor cluster, and he was going to roar into their midst at about forty-five kiloms a second. At that speed even the near-empty lifeboat would hit hard enough to obliterate the biggest ship ever launched. But at that speed, could he be sure of hitting even a big one? He would have exactly one chance if they held their fire — and none at all if they didn't. He felt sure now that they wouldn't fire before he was almost on top of them, because for them every minute of delay was sixty precious seconds of additional secrecy. And he couldn't help thinking that they *might* wait one second too long.

Small benefit to him, of course. If they missed, he would die in an explosion that would ring alarms all the way to Jupiter. And if *he* missed, they could get him going away. Perhaps they wouldn't, though. If he missed, they just might let him pass on. It would take him hours to stop, turn around and come back, and by that time whatever was going to happen would be all over. If he missed . . .

He rejected the thought without passion. His craving for life seemed to have been left behind like some invisible sonic barrier; he was wholly committed. His lifeline would reach a point of infinite discontinuity twenty — no, fourteen minutes from now. He felt a quiet melancholic regret for all the things he had never done, all the promises he had never kept, all the girls he had never kissed; but they seemed rather distant and unimportant now. He leaned back in the seat and put his feet up on the instrument panel, concentrating with dispassionate interest on steering as precisely as possible.

Soon the magnar told him that the squadron should be coming within the five-thousand-kilom range of the spaceboat's tiny radar set. He

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switched it on and there they were, moving smoothly down one of the radial lines in the scope straight toward the bright blob in the center. Collision course. He expanded the field, picked out the biggest blip and carefully centered it on the vertical line. He and the clock had about eighty seconds to run. He peered through the navigation telescope, trying to find his chosen target by eye.

At long last the radio receiver came to life, but he was so intent on truing upon his final approach that it chattered for half a minute or more before he noticed what it was saying.

Admiral-Lieutenant Armin Kaseljian of the Pacific Fleet was a professional and a man immune to panic. Nine years previously the guns of the *Pallas Incident* had smashed his cruiser into a tumbling hulk, fast drifting out of the solar system. Kaseljian had rallied thirty-eight survivors, patched up an engine and restarted it by heroically torturous means, then brought ship and crew back to port under their own power — four years later. From then on he was a man of whom impossibilities were confidently expected.

Kaseljian was fairly sure that spies must have fingered both his departure and his destination, but he did not allow it to disturb him. In his military world intrigue and espionage were sugar and salt; life was a continual game of guessing and outguessing the next man's intentions. Kaseljian was quite at home with it all. In the present instance, straight-ahead, dash-and-smash tactics might have served him well enough, but he was temperamentally incapable of doing the obvious. He would no more make a straightforward move in the face of the enemy than he would tell his wife where he was going when he left the house.

He had blasted away from Hidalgo at standard speed on an evolute curve that might lead anywhere. Certain that he was expected at Phobos, he had lain back and loafed along undetected until sufficient time had elapsed for him to be threatening almost any Atlantic base in the Inner System. With due forethought he had detached a few small ships to spread rumors of his whereabouts in the wrong places. Thus he invited the Atlantic Fleet to scatter in small packets across the Inner Ecliptic, trying to guard everything at once; and as a matter of fact he was succeeding very well. While he was positioning his flotilla for the final swoop, three or four of his decoys were turning up in far corners of the system to broadcast false sightings in the Atlantic code. By this time it would take a week to untangle false data from true and reassemble a force that could handle the Hidalgo squadron. Before that week was up. Kaseljian intended to have the guns of Phobos, Deimos and Lacus Solis on his side, manned by fifteen thousand space marines. It would be a highly shocking coup, of course, but he knew that thereafter he could count on a thousand tireless diplomats and politicians — on all sides — to secure his victory.

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Nonetheless, the Admiral-Lieutenant's nerves tingled inside his small, neat, immobile figure. There was always the chance of premature discovery, of being forced to gamble his mission on the outcome of a running fight. His opponents would know the odds against them; Kaseljian could not. He only knew that the squadron had come a hundred and eighty-five kilometers without as yet sighting a single ship.

Now it was time for the grand audacity, the moment to begin drifting down into the dark. It remained only to true up the relative motions of the ships with respect to Phobos. He stood on the bridge of the battle cruiser *Odrysia,* silently present, listening to the antiphony of orders and acknowledgments, and feeling the pressure of acceleration die away beneath his glistening boots. Now they were committed to the assault.

"ROCKETS H-O-O-O-O!"

Captain Skubic of the *Odrysia* snapped erect above the plotting table. "Where away?"

"Thirty-two degrees off the bow, just south of the Hyades. Six rocket trails in echelon, moving toward Mars."

Skubic took the conning seat and leaned into the twin eyepieces. Setting the periscope for low power he began to turn the aiming knobs. He was a veteran astrogator; it took him only seconds to find the Hyades stars and center in on the little group of jets. He zoomed the lens to high power and stared for half a minute. At last he yielded the conning seat to his admiral. The expression on his face was tense and unreadable.

"Perhaps, sir," he explained, "you will be able to identify these craft for us. They do not appear to be standard."

Behind Kaseljian's wide smooth brow a pulse was chiming cymbals. He leaned into the eyepieces and stared longer than Skubic.

Six machines cruised lazily toward Mars, emitting small jetflames, in a haphazard struggle that hardly deserved the name of "echelon". They were all about the same size, and all blazing orange, but their details differed wildly. One had a long jagged spiral beak that suggested a novelty corkscrew. Another had three asymmetrical batwings studded with complicated projectors. A third sported two flaring collars in tandem, fringed with yards of trailing wire. And so on. They looked like the spawn of a welded-scrap sculpture begot on some monstrous crustacean of indeterminate family. They looked frightful. They might have flown straight off the cover of *Impossible Comics.*

Kaseljian had always made a strict professional point of keeping up to date on whatever was published in Atlantic countries relating to space warfare. It remains an everlasting pity that no one had introduced him to *Impossible Comics.* He would have enjoyed it. It was highly popular aboard the *Gedrosia.*

Skubic rang up Fire Control. "Give me the size and distance of those orange craft."

"Distance, two hundred thirty kilometers. Size, two to three meters long."

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Skubic looked back to the admiral, astounded. Kaseljian stood at parade rest in front of the magnar screen, neat black beard tucked into the cleft of neat black collar, saying nothing.

Two-meter ships!

He reined in his plunging imagination and tried to work out a reasoned conclusion, step by step.

The machines looked utterly fantastic and unspaceworthy. But they *were* in space, and heading somewhere. Therefore they were not unspaceworthy; their strangeness was a product of unfamiliar design principles. But they had never lifted from any planet occupied by man. Of that he was professionally certain. Therefore —

Therefore they were from Outside.

His imagination began to plunge at the bridle's end again. He curbed it fiercely, bringing it down to a more answerable question.

"Shall I try to open communications, my admiral, or shall I fire?"

And really, thought Kaseljian, Skubic put it admirably. There were no other choices. There had been no others since the moment ships were detected in an area where his plans required that no ships should be. His mission demanded that he maintain unbroken secrecy. He could, if he chose, ignore the flying nightmares and hope they would accord him the same courtesy. But in so doing he might be ignoring the fact that would make his mission — and all human history — of no consequence. What matter that the red ants succeed in driving the black ants out of their nest, just when all nests are about to go under the plow?

Skubic's question demanded an answer. Already it had hung in the air for half a minute.

"Launch a reconnaissance fighter. Manned, not drone. Send the pilot to me for instruction."

I could hide forever behind the letter of the regulation, Kaseljian thought. *I could complete my mission in prescribed form and take no responsibility for whatever happened thereafter. I have my orders.*

And I have my responsibilities. On this deck, in this segment of space, I am the highest ranking representative of humanity present. In this hour I act for the human race — all alone.

A fierce-eyed young Afghan in pilot's gear flung himself into the bridge and froze at salute, a pillar of ardent readiness.

"Lieutenant-Commander Sherat! I am happy to know this is in your hands. As you know, we must maintain radio silence, therefore we cannot give you a guiding beam to follow. Steer for Hyades and keep your eyes open for jetflames — use no radar! When you locate these unidentified craft, approach with caution, noticing everything, and try to open communication by blinker light. Whatever sort of contact you make, report only by photophone. We will have a telescope on you all the way. Have you any questions?"

"No sir."

"Then good luck."

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Minutes to wait. And to entertain questions in silence, while the squadron drifted toward battle.

At length the photophone began to glimmer among the stars.

"I cannot approach the unidentified craft closely," Sherat reported. "Their ships are intensely radioactive. I am yet some distance away, several hundred meters, but my motor is beginning to hack a little already from random ionization in the fuel lines. If I go much closer I may lose power. I request instructions. Over."

"If you go any closer," Kaseljian responded, "you may die painfully without learning anything useful. This radioactivity may be some sort of defensive device. Draw away to a safe distance and direct blinker signals at them."

"I shall obey, sir."

Again, wait.

"No response to blinker signals, sir."

"Have you a flare gun?"

"Yes sir."

"Fire flares across their bows."

"I shall obey, sir."

Across the center of the telescope field moved a hot magnesium spark. A second. A third. A fourth.

"No response to flares, sir," reported Sherat.

"Nothing of any kind?"

"Nothing of any kind, sir. Except that the radioactivity seems to be increasing."

"Return to the ship. And accept my compliments, Commander, on your courage."

One man, one machine, exposed to radioactive poisoning. One mystery, tapped at, unyielding. One dilemma, unreduced.

In twenty minutes the sky was scheduled to fall on Phobos. If it should fail to fall, there would have to be reason given. A reason convincing enough to save the career of a man who was expected to do the impossible on demand — and on schedule.

The man who never panicked was not about to panic now. Kaseljian reminded himself that his career was war, and that in war the unexpected is normal. Nevertheless, those uncanny objects were beginning to weigh on his soul as well as his mind. Their superb indifference to a fleet whose smallest gig outweighed them all added to their outlandishness a dimension of dread. And dread he knew to be the most effective of all weapons of war, because it conquers a man without killing him, without even disarming him; it strikes at the heart behind the trigger finger. Of all weapons it was his own favorite. But today it was in another hand.

He tried to assess the situation as objectively as he knew how. Six rockets of midget size and unknown design, throwing out intense radioactivity. They did not respond to efforts at communication.

First possibility: they were robots and had no programmed pattern of response to blinking lights.

Second possibility: they were crewed, or intelligently controlled, and their crews were not interested in contact.

If the first were true, it was logi-

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cal to destroy them to protect what secrecy he had left. If the second it was imperative to destroy them before they did whatever they were about to do. In either event it was deadly to ignore them.

No success had been achieved in trying to communicate with them — but what a small and hurried effort had been made! And then too, to attack them might be suicide; suicide not only personal but racial. Who could know what forces those two-meter hulls inshelled, or what fleets and empires waited on their signal? To shoot was too dangerous to contemplate.

And not to shoot was too dangerous to contemplate.

The hated obvious had brought Armin Kaseljian to bay at last.

As he felt decision forming in him, he wondered vaguely whether he would be shot, or merely permitted to fade into nonentity in retirement. But he was too accustomed to taking the risks of decision to halt. The words crystallized and came out of his mouth.

"Send out the international distress signal. This is a matter we cannot handle alone."

The Martian sky was full of ships of all nations, representing the Council of Powers. Aboard the huge and palatial transport *Carniola*, diplomats were jovially making outrageous excuses, or jovially nodding at them. International good fellowship ran riot. Everybody was gleefully not mentioning the egg on anybody's face. Silky Thornton had stood on a very expensive carpet for a very stern official reprimand and a very broad unofficial wink.

"Guns," Lieutenant Harrod was saying over a snifter of the space marshal's own brandy, "you certainly amused the competition. You even amused me. But precisely how did you turn six nuclear bombs into futuristic toy rocket ships?"

"Pure sabotage, I'm afraid, sir." Silky rolled the brandy tenderly across the back of his tongue. "I jammed the primers in a manner specifically warned against in the manual. Then from a safe distance I triggered the fuses by radio and all the bombs misfired. That is, they stayed subcritical, but they started getting hot, both thermally and radiogenically. Pretty soon the tamping started to smoke, and the smoke came out through a bolt-hole I left the bolt out of. I wired an oxygen cylinder to the side of each can and cracked the valve a little. When the hot smoke hit the oxyjet it ignited it like a torch. Presto! a rocket. The radioactivity ionized the smoke so that it showed up on Kaseljian's magnar as ion trails."

"Black Jack," Gardoni snorted. "That weak a jet wouldn't blow the ash off a cigar!"

"It blew all the gold braid off Comrade Kaseljian."

"How did the cans get those crazy shapes on 'em though?" demanded Wykerman. "Did they start to melt and slag down, or some-m?"

"No. I . . . well, this uncle of mine used to collect mid-twentieth century metal sculpture, and brother, it was frenzied. So I took a leaf out of his book. I helped myself to

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all the scrap lying around the machine shop — and Haig is going to demand my hide for it, I bet, when he catches on — and I welded about a bushel of it on each can, any way that my creative instinct suggested. Then I iced the cake with a coat of orange paint.

"I figured that when Comrade Kaseljian saw the little darlings he would shoot, and that would be our cue to start running around yelling for the cops. But the Comrade fooled me; he yelled first."

Wykerman chortled into a huge beer. "So what are you going to do with the little obscenities now? Present 'em to an art gallery? Or maybe the Smithsonian?"

"It might make me a name and a fortune, but I can't. Those animals are going to go right on getting hotter and hotter until — entirely contrary to regulations — they vanish in puffs of radioactive smoke, at fabulous cost to the taxpayers. I shall have but the memory. And," he mooned over his brandy, "the DT's."

"You and Kaseljian," murmured Gardoni.

"It's so fortunate that you're a hero, Guns," Lieutenant Harrod reflected. "Otherwise you would face fine and imprisonment now that the cat is out of the bag." He began raising fingers one by one. "Misappropriation of government property. Unauthorized use of Fleet armament. Unlawful tampering with same, and sabotage. Unlawful use of fluorescent paint, which as you know is specified for lifecraft only. Unlawful dumping of dangerous rubbish and failure to recover same — although I will testify that you tried. Unlawful creation of hazards to navigation. Unnecessary and unauthorized exposure of personnel and equipment to a radiation hazard. Worst of all, direct and premeditated disobedience to the order of a superior officer. You are extremely lucky to have such powerful friends — and a medal to prove it."

"Isn't it wonderful," mused Wykerman through a ring of suds, "to be a man who can get away with anything?"

"Oh, our brother-in-arms may not have got away entirely clean yet," warned Harrod, drawing a neatly folded paper from his knee pocket. "A certain number of non-regulation activities can now and then be overlooked for the good of the service. But this poem I found in the drawer of the plotting-table . . ."

END

Coming . . . . Tomorrow!

Next issue we start a serial — a good long one — but because we have room to move around in in *Worlds of Tomorrow* we will be able to get it into two installments. Mack Reynolds is the author; and it's *Of Godlike Power*. That is the title, and that's what it is about — power that transcends anything humans have ever been able to wield. And transcendent power — naturally — causes transcendent trouble . . . .

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Seated, l. to r.: Bennett Cerf, Faith Baldwin, Bergen Evans, Bruce Catton, Mignon G. Eberhart, John Caples, J. D. Ratcliff. Standing: Mark Wiseman, Max Shulman, Rudolf Flesch, Red Smith, Rod ing. oto by Philippe Halsman

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